

April 4 2001

Dear Stakeholder

The Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group will meet at the Broomfield Municipal Center at One DesCombes Drive on April 11 2001 from 3 30 to 6 30 p m

The agenda for the April 11 2001 meeting is enclosed (Attachment A) We will discuss the following topics

RSAL Working Group Workshop Update  
Task 1 Peer Review and Response  
End State Management Discussion

The meeting minutes for the March 28 2001 meeting are enclosed as Attachment B

Attachment C is a copy of the City of Broomfield s Comments to the U S Department of Energy (DOE) regarding the Energy National Defense Authorization Act s (NDAA) Long Term Stewardship Report to Congress dated March 15 2001 to Tom Lukow DOE

The Summary from the report *Long Term Institutional Management of U S Department of Energy Legacy Waste Sites* by the National Academy of Sciences is Attachment D

Attachment E is an article *From Waste to Wilderness Maintaining Biodiversity on Nuclear Bomb Building Sites* Robert H Nelson April 2001 We are including this document in the packet because it is getting wide distribution in Washington and may be useful as background information for the Focus Group It has not been brought forward or endorsed by any member of the Focus Group

Questions for Peer Reviewers of RSAL Task 2 Model Evaluation are listed in Attachment F

If you need additional information to prepare you for the Focus Group discussion on April 11 2001 please contact Christine Bennett of AlphaTRAC Inc at 303 428-5670 (cbennett@alphatrac.com) Christine will help to find the appropriate resource for you

You may call either Christine or me if you have any questions comments or suggestions concerning the RFCA Stakeholder Focus Group or the upcoming meeting

Sincerely

C Reed Hodgins CCM  
Facilitator / Process Manager



DOCUMENT CLASSIFICATION  
REVIEW WAIVER PER  
CLASSIFICATION OFFICE

1/52

ADMIN RECORD

SN-A-004346

## **RFCA Stakeholder Focus Group Meeting Agenda**

**When** April 11, 2001 3 30 - 6 30 p m

**Where** Broomfield Municipal Hall, Bal Swan and Zang's  
Spur Rooms

3 30 3 40 Agenda Review 3/28 Meeting Minutes Review Objectives for  
this Meeting

3 40-4 25 RSAL Working Group Workshop Update

4 25 5 30 Task 1 Peer Review and Response  
Agencies key issues and responses  
Focus Group discussion  
Task 1 closure - Round Robin

5 30 5 40 Break

5 40 6 20 End State Management Discussion  
Introduction  
Post Closure Management and Options - Overview and  
Issues Identification

6 20 6 30 Set Future Agendas and Review Meeting

6 30 Adjourn

April 13 2001

Dear Stakeholder

Enclosed are tables depicting the sensitivity of different parameters within RESRAD 6.0 model for different pathways and different radioisotopes

You may call either Sandi MacLeod or me if you have any questions, comments, or suggestions concerning the enclosed

Also enclosed is the first peer reviewer's comments on Radioactive Soil Action Level (RSAL) Task 2 Model Evaluation

Sincerely

Christine Bennett  
Process Administrator

**RFCA Stakeholder Focus Group**  
**March 28, 2001**  
**Participants List**

NAME		ORGANIZATION / COMPANY
Lorraine	Anderson	City of Arvada
Christine	Bennett	AlphaTRAC Inc
Kent	Brakken	U S DOE RFFO
Laura	Brooks	Kaiser Hill Company LLC
Kimberly	Chleboun	RFCLOG
John	Corsi	Kaiser Hill Company LLC
Gerald	DePoorter	RFCAB
Sam	Dixon	City of Westminster
Carey	Dowling	AlphaTRAC Inc
Shirley	Garcia	City of Broomfield
Joe	Goldfield	RFSALOP
Aaron	Grider	Jefferson County
Mary	Harlow	City of Westminster
Jerry	Henderson	RFCAB
Reed	Hodgin	AlphaTRAC Inc
Victor	Holm	RFCAB
Martha	Hyder	Wind River Environmental Group
Ken	Korkia	RFCAB
Joe	Legare	DOE
Jean	Lillich	US EPA
Ann	Lockhart	CDPHE
Carol	Lyons	City of Arvada
Sandi	MacLeod	U S DOE
John	Marler	RFCLOG
Tom	Marshall	Rocky Mountain Peace and Justice Center
Dan	Miller	Natural Resources and Environment Section
		Colorado Department of Law
LeRoy	Moore	RMPJC
Mark	Sattelberg	US Fish and Wildlife Service
Dave	Shelton	Kaiser Hill Company LLC
Carl	Spreng	CDPHE
Noelle	Stenger	RFCAB
Honorable Hank	Stovall	City of Broomfield

# DRAFT

Wildlife Risk Assessment (Ad Its)

## Summary of Exposure Variable PDFs for use in RESRAD Modeling

Soil g t i R t (IR)	Exposure Variable	PDF		I p t to RESRAD	U lts	I p t to RAGS ( lts)	U lts	So c d C mme ts
		Poln	I p t Type					
		X		Triangular (0 17 5 35)	gm/y	Triangular (0 50 100)	mg/d y	T RME I reported RMA 106 mg/d y which m l t th res d t i ce no ppl d here N t t th RME for contact t ve sce 330 mg/d y (115 5 kg/y) pe EPA S i Screen g G id ce
I h l i t i R t (IR)			X	8 8 + (160 8 8) x Beta (1 79 3 06)	m /d y	1 1 + (2 0 1 1) x Beta (1 79 3 06)	m /h	I f f i c i t d ta from EPA EFH t ge arate PDF f b r th g rates PDF g e aled by r y g th e g h t g f c t o r s f o r l i g h t , m e d i u m d h v y a c t i v i t y (1 1 1 3 n d 2 0 m /h) e e T b l e B 2 1 4 f RMA e o r t n d CDPHE e h y s (D N e d z w i c k) B e t a f i t t o B e t a (n a s q r e 0 1 7 5) h n p e p a r a m e t e r s r e g i v e n n d y e i l d i b e t w e e n 0 n d 1 0 f o r C r y s t a l B i l m o d i f y f o r s c a l e n g m m (m a -m i) b e t a f o r @ R s k m o d i f y f o r s c a l e s i n g m m b e t a t c o v e r s i o n m 3 / d a y m /h 8 h / d a y
Occ p c y F t		X		1 0	ti s	NA		I t a k r a t r e p e c i f t o t h W i d i f R f u g w o r k r t h e r e f o r e t a k a l e d n o t e e d t o b e a d j t e d
Expos Time (ET)		X		NA		8 0	hrs/d y	p r o f e s s i o n l y d i g m e t t i l l f t h e p o l e n t s l x p o s u r e o c c u r s d r i n g f u l l w o r k d a y
E p o F r e q y (EF)		X		NA		Truncated Normal (225 10 23 200 250)	d y s /y	RMA report m m g r v e y d t a f o r b i o l o g i c a l w o r k e r s ( 2 0) (p p B 3-149 150) t r u c a t i o n l i m i t r e p r o f e s s i o n a l j u d g m e n t t h t m m m f u l l t i m e w o r k d y s / w k 5 0 w k / y r m x 5 d y s / w k 5 0 w k / y r
E p r e D r a t i (ED)		X		Truncated Normal (7 18 7 0 40)	y r s	Truncated Normal (7 18 7 0 40)	y r s	RMA report m m g r v e y d t a f o r b i o l o g i c a l w o r k e r s ( 2 0) (p p B 3 1 2 7 5) t r u c a t i o n m t a r e p r o f e s s i o n a l j u d g m e n t t h t m m m f u l l t i m e w o r k d y s / w k 5 0 w k / y r m x 5 d y s / w k 5 0 w k / y r
M s Loading f i h l i t i (MLI)		X		pending	m /kg	NA		B N n g t o p r e s e n t l e p e c i f i E D F s e e c o m m e n t f o r P E F
P r t i l t e E m i s i F c t (PEF)		X		NA		1 3 2 E + 0 9	m /kg	EPA 2000 Soil Screen g G d a n c e f o r R a d i o n u c l i d e s V l u e n a t e d (I / P E F) o r 7 5 8 E - 1 0
I d o T i m F r a c t i (F)		X		0 5	ti s s	0 5	ti s s	RMA survey l a t e 0 5 m e s p e t d o o r s
Outdoo Time F r a t i (F <sub>out</sub> )		X		0 5	ti s s	0 5	ti s s	
I d o o r d D s t F i l t r a t i F c t o		X		0 7	ti s s	NA		v e r a g f n d o o r s ( 0 4) d e s c r i b e d i E P A S o i l S c r e e n i n g L e v e l G d n c e f o r R a d i o n u c l i d e s d B e t a i t R E S R A D n d o u t d o o r s ( 1 0) a s s u m e s w o r k e r w i l l s p e n d t i m e n d o o r s w h e r e w i n d o w s d o o r s w i l l b e o p e n d r i n g s u m m e r m o n t h
Extern I G m m s S h i d i g F c t (see omn t)		X		0 4	ti s s	0.4	ti s s	EPA 2000 Soil Screen g G d a n c e f o r R a d i o n u c l i d e

ED m y b e t r e d r a d m v a r i a b l e R E S R A D 6 0 t h s e t f p u t a l s f o r l l p o s r e b l s r e d e t e r m n e d f o r Y e a 1 d p p l e d c r o s s l l y e a r s t h r o u g h o u t t h e E D

# **Path Forward Proposal for Focus Group**

**March 28, 2001**

## **Agenda Group**

**Christine Bennett, Shirley Garcia, Mary Harlow, Reed Hodgins,  
Ken Korkia, Joe Legare, John Marler, and Tom Marshall**

# Focus Group Community Process

## Discussion from 2/28/01

- Community Interests for Focus Group
  - Collaborate with agencies on cleanup analyses and decisions
  - Understand the objectives for each discussion
  - Get closure on each issue addressed
  - Collaborate with agencies on setting Focus Group agendas

- Focus Group Process

- Agencies and community should set the path forward
- Establish a steering committee to set meeting agendas
- Agendas should have time for full dialogue on each issue
- Prior to a meeting, the agencies should provide background information on each issue to be discussed
- Focus Group should have a round robin at the end of each meeting to get a key thought from each participant
- A holistic “check-in” should be a part of every meeting -- where we are in the big picture and where we are going next



# What We Propose

- Agenda group (agency staff and community members) will work together to determine path forward and set agendas
- Each meeting will contain a review of the path forward and the goals and objectives for each agenda
- Each issue will be explored fully but within the framework and schedule determined by the agenda group
- Agencies will provide background material before the meetings and Focus Group will be expected to review this material and be prepared for the meeting

# April 11 Focus Group Meeting

- RSALs Regulatory Analysis (Task 1)
  - RFCAs Parties' Responses to Peer Review Comments
  - Focus Group Summary of Task 1 Issues (Task 1 report, peer review reports, supporting documents)
- ER Issues Stewardship

**Attachment**  
**National Defense Authorization Act (NDAA) Long Term Stewardship Report**

Comments/Issues on the NDAA Report Rocky Flats Environmental Technology Site (RFETS) section provided by the City of Broomfield

- 1      Page 85   1 1 Site Description and Mission ¶2

DOE has to perform a NEPA analysis for land use decisions and this process can be taking place now. The Comprehensive Risk Assessment (CRA) will play a major role with the NEPA process. Define the identified criteria DOE will have in the analysis and the process for determining the alternative analysis.

- 2      Page 87   1 1 Site Description and Mission ¶ 1

The Closure Project Baseline assumes that three closure caps will be installed over the Solar Ponds, the Original Landfill, and the Present Landfill. The City of Broomfield cannot support the use of caps at this time. Broomfield has requested additional information pertaining to the type and use of proposed caps to formulate an informative decision on the subject.

More information is required to determine the type of caps to be installed over the contaminated sites. The caps must meet the requirements of a Subtitle C Landfill or meet the equivalent criteria. We have yet to see any scientific data pertaining to evapo transpiration caps utilized within this area. More information is needed such as

- ✓ Expected life cycle of the proposed caps (evapo transpiration & routine caps)
- ✓ Required O&M
- ✓ Specific engineering criteria
- ✓ QA/QC criteria
- ✓ Type of physical inspections (Checklist)
- ✓ Preventive vector intrusion
- ✓ Access restrictions
- ✓ Security (include signs)
- ✓ Sampling criteria (SAP, DQOs, Validation, Review of Data, Reporting)
- ✓ Stakeholder annual review of identified parameters to guarantee the integrity of the engineered controls
- ✓ Corrective Actions
- ✓ Funding
- ✓ Emergency Response (Identify all possible scenarios such as flooding, fires, accidents, etc.)
- ✓ Identified Project Manager and core team
- ✓ Training
- ✓ Hold points to be identified in Burn Plan, Vegetation Plan, and any other identified plan that may impact the integrity of the cap(s)

- ✓ Identify specific modeling utilized to determine the migration path of the contaminant(s) and the length of time for the contaminant to be treated

The proposal for the use of evapo transpiration caps is based on what science and/or technology? The issues with standard industry caps used within the area should be identified and alternative solutions should be explored to correct deficiencies with standard industry caps

3 Page 87 1 1 Site Description and Mission ¶2

The document states DOE the EPA and the CPHE are currently unable to commit to clean up to background levels These Agencies will continue to explore new technologies to make further cleanup possible The document implies technology does not exist to clean up to background levels today The technology does exist but the budget does not allow for clean up to background levels Costs for short term remedies should be compared against the costs to maintain long term stewardship We have yet to see the dollar values Further cleanup in the long term future is addressed but there will be no funding to allow for additional remediation in the future The process for procuring additional money has yet to be identified

4 Page 87 1 1 Site Description and Mission ¶3

The third paragraph addresses remaining contamination at the Site and states the contamination is derived from similar sources Are the sources similar contaminants or similar sources of contamination? The sources of contamination are not similar in that they may come from beneath the Solar Ponds landfills PA OPWLS groundwater plumes or 903 Pad The document states the remaining contamination may be spread across various media such as groundwater soils and facility foundations We need to know the impacts and ramifications of the contamination associated with facility foundations The foundations being porous may act as a sponge to capture the COCs for a length of time thus reducing COCs within groundwater and soils during monitoring evolutions for a specific time period At a later date the foundations will degrade and release the COCs and due to previous analytical data sampling may have been suspended This scenario needs to be captured within the CAD/ROD and Contingency Plans DOE must show due diligence in protection of human health and the environment

5 Page 88 1 2 Site Cleanup and Accomplishments ¶3

Characterization of the Buffer Zone is not identified The process for the CRA needs to be clearly defined and must include COCs remaining within the groundwater foundations soils and vegetation How can the CRA be performed if there is insufficient modeling and characterization of the site? How will the site be delisted if COCs remain? At what time will delisting take place? The ROD needs to clearly define DOE as the responsible party for delisting of the site In addition DOE has to be the responsible party for perpetuity of the contaminants and the site

6 Page 88 1 2 Site Cleanup and Accomplishments ¶ 4

The RFCA Integrating Decision Document (RIDD) will be completed in 2003. This document will define cleanup levels, establish the future land use scenarios, and describe the cleanup activities and remedial actions to close the site. Broomfield wants to ensure the RIDD is not a generic document, but a specific document that addresses each unique IHSS, PAC, or UBC area. The RIDD should include not only the range of activities, but also the choice of remedial activities and alternatives to the activities to envelop all scenarios if additional information is revealed. The RIDD as a minimum should include:

- ✓ Identified areas requiring remediation
- ✓ Level of contamination of each area
- ✓ Identified contaminants for each area
- ✓ Modeling performed for each area (such as AME plume, water balance, etc.)
- ✓ Identified corrective actions for each area (strategies, cleanup levels, holistic impact to the site, implications to long term stewardship, O&M, training, etc.)
- ✓ Chosen remedy for each area and reasoning why the remedy was chosen (protection of human health and the environment, long term stewardship, implications, costs, public acceptance, life of the contaminant, etc.)
- ✓ Alternative remedies for each area (may have new information/characterization and may need a backup plan)
- ✓ Determine if the actions meet the requirements of the CRA
- ✓ Contingency Plan

As new information about the site is made available or new science and technology is presented, can the RIDD be revised during the cleanup process? Clarify the RIDD process and stakeholder's input.

DOE should start compiling a list of long term stewardship obligations and requirements for the CAD/ROD. Crucial to the document is the transition between K H and the new subcontractor. Broomfield does not foresee Fish and Wildlife as the subcontractor of the areas with residual contamination. The subcontractor should be experienced with O&M and contingency plans associated with CERCLA/RCRA projects and programs. The Project Manager and team should be accessible to the activities and operations at all times.

7 Page 89 1 2 Site Cleanup and Accomplishments ¶ 2

Broomfield adamantly opposes the removal of the onsite detention ponds and conversion to wetlands after closure. It has been proven that the A, B, and C Series Ponds have successfully acted as sedimentation ponds to capture radioactive contaminants. The removal of these ponds will take away the first line of defense for release of contaminants to offsite communities. Broomfield requests additional information related to the application of wetlands within an arid climate. To provide an more informative decision, Broomfield requests the following information:

- ✓ Provide historical data pertaining to the use of wetlands and the efficiency of radioactive contaminant removal (include sites COCs length of time used for treatment etc )
- ✓ Provide information on the amount of water needed to adequately maintain a viable ecological state for the wetlands
- ✓ Identify where additional water sources will come from if needed (water rights and costs to purchase the rights funding and the process)
- ✓ Identify the dormant season for wetlands and the length of the dormant season for this area
- ✓ Identify the season(s) of the year for this area in which there is a potential for high runoff thus migration of contaminants
- ✓ Identify efficiency of wetlands during their dormant seasons
- ✓ Identify the efficiency of wetlands during periods of high runoff or flooding
- ✓ Identify the Contingency Plan for mitigation of releases offsite (funding corrective actions etc )
- ✓ Identify the Contingency Plan if the wetlands do not function per assumptions

If the ponds are removed how will they be remediated? Per the report some of the ponds do have radioactive contaminants Per the NDAA report the ponds are to be removed after closure Who will perform the work? How will the project be funded? Will the Site Water Balance Study and the Land Configuration Study perform their studies with the proposed scenario of removal of onsite ponds?

Broomfield requests the studies use several scenarios to evaluate the best strategy for final site closure and long term stewardship These decisions should be scientifically and technically sound Broomfield requests that the Water Working Group be informed of the key issues and be part of the process to determine final closure activities at the site

## 8 Page 89 Site Remediation Strategies ¶ 1

In IHSSs where it is technically or economically not possible to remove contamination to less than action levels identified in the RFCA an engineered unit will be constructed to manage the residual hazard associated with the area Define an example of where it is not technically possible to remove contamination at the site Define the process for determining when remediation is not economically feasible How are costs measured against long term stewardship costs? Broomfield requests DOE provide the following information to better understand the decision making process for determining costs

- ✓ Identified costs for remedy of an area with remaining residual contaminants
- ✓ Identified additional costs to remove additional residual contaminants (labor equipment disposal costs etc )
- ✓ Identified long term stewardship costs
  - Project management
  - Subcontractor
  - O&M (sampling inspections preventive O&M etc )

- Training (Safety Information Qualifications/Certifications)
- Security
- Contingency Plans
- Replacement of filter media and disposal of media
- Plans and Procedures to use when treatment unit media is being replaced
- Ecological controls and monitoring
- Information and Records Management
- Review of engineered units operations and controls
- Review of new science and technology
- Annual review by stakeholders of analytical data new science and technology

Other remedy options are identified such as stabilization Provide Broomfield with a scenario of where and how stabilization will be used

9 Page 89 Site Remediation Strategies ¶ 2

Groundwater engineered units are mentioned that represent a potential threat to surface water quality Broomfield questions the efficiency of the Solar Ponds treatment unit It is our understanding not all contaminated water is being captured by the unit What are DOE s plans to correct this situation prior to closure? What measure is in place to identify any corrective actions? To address long term stewardship issues and objectives please provide the following information pertaining to the Solar Ponds treatment unit

- ✓ Length of time required to operate the unit (include amount of times required to change out the filter media)
- ✓ Length of time for contaminants to migrate through the unit and be treated
- ✓ Modeling performed to determine how groundwater plumes migrate
  - Was the modeling performed with the revised location of the unit?
  - What other modeling was performed associated with this unit?
- ✓ The temporary modification allows for increased levels of nitrates through 2009 What are DOE s plans to ensure the water quality standard is met by 2006? Will there be additional funding to ensure the standard is met?
- ✓ How will all the barriers and passive treatment systems be captured in the final CAD/ROD?
- ✓ Identify hold points or associated issues with the treatment systems (sufficient flow for them to operate efficiently change in final water balance etc )

Define the process for the placement of additional barriers and treatment systems for any other plumes Identify alternative to the treatment units Broomfield is apprehensive with the report stating additional barriers and treatment systems may be utilized to treat contaminated plumes from the Industrial Area Until issues associated with the current treatment systems are resolved the City does not have any confidence the additional barriers will function in their intended capacity When treatment systems are utilized Broomfield strongly believes the unit must meet water quality standards when the unit is in operation With a limited amount of funding

Broomfield wants to see the remediation done once. The objectives of the systems are to protect human health and the environment.

10 Page 90 Site Remediation Strategies ¶ 1

If natural attenuation is proposed, define the modeling utilized to determine that natural attenuation will take approximately the same amount of time to treat contaminants as that of an active/passive treatment unit. Groundwater monitoring is conducted to monitor the progress of natural attenuation of the plumes. How are organic compounds that degrade into other compounds monitored? In the past, the process for monitoring contamination levels has not been clearly defined. The 881 Hillside CAD/ROD showed a linear reduction in levels of contamination, but the levels showed a routine seasonal spike in the data. The process needs to be clearly defined and understood to determine if natural attenuation is indeed occurring and is consistent with modeling parameters.

11 Page 90 Site Remediation Strategies ¶ 1

The report discusses surface water management to include detention ponds and drainage ditches, which are monitored. When was the last time the sediment in the ditches and ponds was sampled? What were the concentrations of the contaminants? What are the depths of sediments within the ponds? What is the approximate sediment loading for the ponds? DOE has not been able to determine specific sources of contaminants in the past with elevated sampling results. How can Broomfield be assured the majority of sources have been removed by 2006 and the wetlands will stabilize the sediments during periods of high run off or during dormant seasons? Artificial wetlands, if not adequately planned, are expensive and difficult to maintain. Provide information regarding the activities associated with maintaining wetlands and the success rate for survival of revegetated wetlands.

12 Page 90 Getting to Closure ¶ 2 second bullet

The identified detention ponds will be dredged prior to 2006 per the NDAA report. Define the details of the dredging and the proposed schedule for the activity. If the sediment is radioactive by default, how will the material be dried to meet DOT criteria and disposal criteria? Are there any activities planned for the South Interceptor Ditch SID? What are the sediment loading parameters for the SID, or does most of the sediment settle out in the C series ponds? Has sediment within the SID ever been sampled? If sampling has occurred, what were the levels of contamination and the identified contaminants?

13 Page 90 Getting to Closure ¶ 2 last bullet

What does the report infer by stating removal of all wastes and special nuclear materials from the site are subject to negotiation and agreement with the regulators? Is the plan referring to orphan wastes, SNM, or remediation wastes? How will the



regulators be part of the negotiation process if RFCA states all waste will be removed from the site prior to closure? Provide an example of waste type that may fit into this category What plan is DOE currently drafting to address the disposition of orphan waste? Does the site have any waste streams that currently do not meet DOT requirements? Provide the City with an inventory of waste streams that do not have an identified disposal site or currently do not meet DOT or WAC criteria

14 Page 91 Getting to Closure ¶ 1

Define the process for characterizing and stabilizing process lines The document states segments of lines with contamination levels below action levels identified in the RFCA will be stabilized in place How will characterization inside pipes be performed? Characterization of pipelines per the IASAP is based on associated soil contamination Incorporating long term stewardship goals contaminated pipes may break in the future and release contaminants into the environment or act as a pathway to contaminate groundwater Again the NEPA process is crucial because it evaluates soils and geology If stabilization is performed is the process going to be foaming? Will the foam be organic based? What is the life expectancy of the foam? At what depths will lines be left in place or removed? With process lines remaining foundations remaining and concrete rubble being dispositioned onsite how will DOE evaluate residual contaminants for the CRA?

15 Page 91 Getting to Closure ¶ 2

This paragraph contradicts the previous paragraph The previous paragraph states the remediation strategy for underground lines will not focus on the integrity and precise location of each line The second paragraph states characterization of UBC is based on the SAP that identifies underground lines and incorporates characterization needs associated with related contamination areas If process lines are not identified or located how can you develop a SAP? DOE should provide the needed details within the ERSAP and clarify the stewardship goals and objectives

16 Page 91 Getting to Closure ¶ 3

Broomfield wants to ensure the groundwater treatment systems operations maintenance and associated activities are clearly identified within the final CAD/ROD to ensure protection of human health and the environment Clearly defined parameters need to be acknowledged within the CAD/ROD to determine if and when corrective actions are required during the period of long term stewardship The report states groundwater associated with all eight plumes is anticipated to require continued monitoring during the long term stewardship period Define the long term stewardship period The report shows funding will continue until the year 2070 The groundwater will still pose a health risk past 2070 Will the period end when all residual contamination and analytical data are below Tier I levels? Will treatment units be removed when they are no longer needed? Define the modeling utilized for groundwater plume migration and the length of time it will take for

residual contamination to no longer be a health risk. Parameters need to be identified for both treatment units and natural attenuation. With the information provided by DOE that contaminants will be left in place, the assumption the City formulates is long term stewardship will continue until perpetuity. How does DOE draft a long term stewardship plan to meet goals and objectives for perpetuity?

17 Page 91 Getting to Closure ¶ 4

Define the timeframe for the concentration of contaminants in groundwater to meet regulatory limits i.e. for three consecutive sampling evolutions one year or per a specified timeframe. What is the protocol when there is insufficient water to sample? Broomfield wants to ensure the sampling protocol and procedures meet the regulatory drivers and all sampling parameters are clearly identified to ensure chosen remedies meet water quality standards. The processes to establish timeframes for groundwater treatment system operations and monitored natural attenuation of groundwater will need to be clearly defined in the ROD. **The ROD will not be drafted until 2006 or later**. Broomfield is concerned DOE is not considering a boilerplate at this time for relevant items to be integrated into the ROD. Again, Broomfield is concerned with the allocation of funding after FY 2006.

18 Page 91 Getting to Closure ¶ 5

Broomfield requests more information on the proposed controls to manage surface waters onsite. How are well designed passive systems consistent with the stakeholders' visions for future site uses as open space? Again, long term stewardship decisions appear to have been made without using the stewardship tools to formulate a responsible evaluation.

19 Page 92 Getting to Closure ¶ 2

Broomfield understands the inventory is dynamic and requests generation rates for D&D. For the identified waste inventory, what percentage of the wastes are legacy wastes and/or orphan wastes?

20 Page 92 2.1 Long Term Stewardship Activities

The City is concerned the transition from K. H. to the new subcontractor is not distinct. Broomfield understands Fish and Wildlife will not be responsible for the areas requiring long term stewardship activities. The management of site lands and natural resources is the responsibility of both the subcontractor and Fish and Wildlife. It is crucial to bring in the subcontractor at least six months prior to K. H.'s exit to allow for an exchange of information and orientation.

Stakeholders need to assist with the identification of POEs and POCs after final land configuration. The POEs and POCs should be clearly identified in the ROD. Dialogue needs to be encouraged to determine if the IMP should support the ROD or

if the POEs and POCs should be in the ROD along with other sampling criteria to make them legally binding

The Federal government currently owns and may continue to own the entire site including the Industrial Area and the Buffer Zone Broomfield is adamant DOE shall continue to own the site for perpetuity Broomfield strongly believes DOE should be responsible for long term surveillance and maintenance and other long term stewardship activities at the site throughout the period of long term stewardship A successor agency will be unacceptable DOE needs to define the Project Management team and associated long term stewardship activities Organization charts with corresponding responsibilities and activities should be generated during the transition period to ensure all activities have been addressed The last sentence on page 93 of the first paragraph does not identify surface water monitoring

This final stewardship plan should include a checklist to describe activities to maintain control of residual contamination and the stewardship tools utilized to maintain the controls Examples fences erosion controls (ditches SID wetlands ponds etc ) signs ecological monitoring (Burns PMJM weed control vector intrusions thatch build up population management seeding etc ) security waste management (treatment systems solid waste disposal training characterization etc) O&M (pumps caps subsidence sluffing access to LTS areas freeze protection sampling shipping/transport of samples certified labs validation of data review of data presentation of data on an annual basis if routine etc ) Contingency Plans and corrective actions

21 Page 93 2 1 Engineered Units ¶ 1

The document does not identify the inspection timeframe for caps/covers The report assumes caps/covers will be used but does not identify the IHSSs in this section DOE has not identified specific monitoring and maintenance action or their respective frequencies The basis of cost estimate is not inclusive of all activities associated with engineered units The acknowledged activities associated with the caps/covers do not include corrective actions or Contingency Plans The City anticipates engineered units will fail and the plan does not address this crucial issue which is key to long term stewardship The bulleted activities reflect the installation of the units not the surveillance and maintenance activities Procedures including QA/QC guidance and training are an integral part of surveillance and maintenance

22 Page 93 2 1 Engineered Units ¶ 2

Operations of the passive groundwater treatment and leachate collection system are discussed for the Present Landfill Broomfield is concerned site security activities will be limited to weekly inspections of the sensitive areas Another concern is monitoring and sampling personnel will conduct the security inspections Define sensitive areas for the City Will the monitoring and sampling team have adequate training and equipment to address security deficiencies? Broomfield would like to

see a draft checklist for the security inspection incorporated into the Long Term Stewardship Plan

23 Page 93 2.1 Engineered Units ¶ 3

The document states air sampling will be performed for the engineered units if installed. Broomfield is concerned additional air monitoring will not be performed during the long term stewardship period. Project specific monitoring must be performed to ensure each unit is functioning properly and protecting the environment. Sampling and analysis will be conducted in accordance with an air quality sampling and analysis plan and procedures. Broomfield would like to be part of the development process of the plans and procedures. The City is concerned only two analytes will be monitored and this is insufficient. The proposed engineered units to be capped/covered contain volatile organics and Broomfield request the list of monitored analytes be expanded to capture organic analytes to ensure NESHAP compliance. Does the cost estimate for air quality include maintenance and replacement of equipment?

24 Page 94 2.1 Groundwater Treatment Systems ¶ 1

If DOE intends to install additional groundwater barriers to treat groundwater migrating for the Industrial Area, what modeling will be used to determine the time period required to treat the groundwater? Will DOE integrate the Water Balance Study and Final Land Configuration Study prior to the modeling? Does the long term stewardship cost estimate include the removal of the filter media and disposal of the media? Additional cost for equipment and transportation will be required to maintain the operations of the units. It may be best to schedule the replacement of the filter media in all the units at one time to reduce labor, transportation costs, and disposal costs. The document uses the term "classified" to mean "characterize". How will the media be characterized and by whom? How will the media be dried prior to shipment? A health and safety technician is identified as part of the services required to remove the spent iron. Will the health and safety technician be a RCT? Will the subcontractor provide a separate RCT and DOT qualified person to assist with the removal of the spent iron? If fences are not enclosing the treatment cells, how will DOE secure the units? How will the units be identified to warn the public of their location? Who will identify and verify the complex training requirements for the subcontractor? Broomfield assumes the subcontractor will have to have OSHA, DOT, HazCOM, Rad Worker, etc. to perform the job.

25 Page 94 Table of Chemical Constituents Monitored in Groundwater

Why aren't Archlors identified on the list? Does the list include the range of pesticides used at the site?

26 Page 95 Groundwater Monitoring Systems ¶ 1

The final ROD needs to clarify the frequency of sampling for the groundwater monitoring systems. The Water Working Group needs to be involved in the development of the specifics for groundwater monitoring which will be incorporated into the ROD. The parameters need to be explicit to ensure stewardship goals and objectives are met. Stakeholders must be part of the process for finalizing the IMP to ensure the procedure and the sampling schedule reflects a robust stewardship program.

27 Page 95 Surface Water/Sediment Management Systems ¶ 1

See previous comments related to the dredging of two of the C Series ponds item # 7. See item # 7 discussing the removal of the sediment ponds. The NDAA report states surface water in the streams and wetlands will be sampled on a monthly basis as indicated in the Integrated Monitoring Plan (IMP) for the site. Surface water will be sampled from eight onsite locations including three stream segment locations and five wetland locations for plutonium, americium, tritium, beryllium, chromium, silver, and cadmium. The City has a strong stake in the management and monitoring of surface water entering Walnut Creek. There has not been any dialogue identifying the future POCs or POEs. How can a decision be made determining using eight onsite locations without the final studies of the Land Configuration Plan or the Water Balance Plan being finalized? Describe the long term stewardship process DOE used to conclude eight sites will be sampled. Provide the City with the information DOE reviewed to conclude eight sites are sufficient to protect water quality both onsite and offsite. Due to the temporary standard DOE has for nitrates, why are nitrates not identified on the list of analytes for surface waters? There is no discussion of sediment sampling within the onsite ditches or within the SID. Will ditch or SID sampling occur during periods of high runoff due to the information provided by the AME Group which indicates actinides migrate by sediment transport?

28 Page 95 Surface Water/Sediment Management Systems ¶ 2

What document will identify the owner's responsibility for maintaining water conveyance systems? How will owners be identified as responsible parties for conveyance systems? Are any owners located with an area that contains habitat for the PMJM? Does DOE plan to develop a HCP for the PMJM specific to the site and its activities? If the Water Management Closure Plan identifies a need for additional water to maintain the proposed wetlands, where does DOE intend to acquire additional water? Please explain the options DOE may propose for closure of the site's wastewater treatment plant and detention ponds. Broomfield understands per the baseline, the wastewater plant will be decommissioned prior to 2006.

29 Page 95 Institutional Controls ¶ 1

The City believes the RFCA parties should commence a list of institutional controls (ICs) to manage residual contaminants. A study should also be drafted to provide information pertaining to ICs and methods to ensure stewardship goals are attained.

30 Page 96 Environmental Monitoring ¶ 1

Define surface water aquatic monitoring If DOE intends to spray approximately five percent of the site with pesticides annually what will be the impact to surface water? How will the surface water be monitored? The use of controlled burns for the control of noxious weeds and thatch buildup is not identified in this section Add the use of control burns as a method utilized to correct documented deficiencies during environmental monitoring Erosion control measures need to be expanded to include inspections after a major storm event within a specified timeframe

31 Page 96 Environmental Monitoring ¶ 2

Environmental sampling personnel conducting physical inspections of the site will not have the equipment to perform corrective actions when the integrity of treatment units caps/covers wells or site conditions are breached An annual inspection of the site features is inadequate to maintain site security and protection of human health and the environment The final ROD must identify inspection criteria which will include inspections after a major storm event Again actinide migration is a key concern for the City of Broomfield Inspection reporting will be included in a Five Year Review Report per the NDAA document A five year review is inadequate Broomfield requests inspection and analytical data be reported on an annual basis to stakeholders to ensure long term stewardship goals are sustained

32 Page 96 Record Keeping

Broomfield is concerned records will be maintained out of state and stakeholders will not have access to vital documents impacting surrounding communities Records should always have backups in the event the originals are destroyed Stakeholders must have a process to have records available to ensure long term stewardship activities at the site are successful and the public s safety is being protected

33 Page 96 2.2 Assumptions and Uncertainties second bullet

Broomfield is concerned the document references the Federal Government may not maintain ownership of the entire site property One of the key institutional controls DOE has proposed thus far is to maintain the property as federal land to ensure long term stewardship of sites remaining with residual contaminants **DOE has to be a responsible steward for perpetuity**

34 Page 96 2.2 Assumptions and Uncertainties sixth bullet

Broomfield is concerned with the approach of having passive water management systems (wetlands) in place of maintaining the sediment ponds The addition of more active water management systems to meet water quality standards needs to be clearly defined Alternatives other than passive treatment units need to be identified Issues with previously installed units have raised questions as to the adequate treatment of

contaminants Broomfield will be requesting modeling to ensure all water is being treated onsite to protect water quality onsite and offsite

- 35 Page 97 2 2 Assumptions and Uncertainties third bullet

The document states It is likely that the current number of groundwater wells (89) required for monitoring purposes may be reduced in the future What is this statement based on? Again a stewardship decision is made without utilizing stewardship tools to develop a robust long term stewardship plan

- 36 Page 97 2 2 Assumptions and Uncertainties fourth bullet

Vehicle access is necessary to perform inspections and sampling at the site If roads are not maintained personnel will not be able to access crucial areas of the site during critical periods to ensure containment of contaminants Snow depths muddy conditions and runoff may prevent personnel from traveling onsite Key roads to sensitive areas with residual contamination have to be maintained

- 37 Page 97 2 2 Assumptions and Uncertainties eighth bullet

DOE shall maintain ownership of the site to ensure funding and management of the site for perpetuity This section implies DOE may not maintain ownership of the site

- 38 Page 97 2 2 Assumptions and Uncertainties tenth bullet

Broomfield will continue to be involved with the Water Working Group and the Surface Water Working Group to ensure required sampling is specified in the *Integrated Monitoring Plan* (IMP) and the ROD

- 39 Page 97 2 3 Estimated Site Wide Long Term Stewardship Costs

The City is concerned with the cost estimates for long term stewardship Funding is not available for well maintenance or groundwater modeling Why are there travel vehicle and lodging costs associated with required air quality monitoring? The site has several local people that can perform this task How did DOE arrive at the 35 0 percent contingency cost? Does the information systems cost include the validation and review of analytical data? Operations costs do not seem to reflect costs to change out filter media package the media transport the media and dispose of the media

- 40 Page 99 3 1 Groundwater

Broomfield is concerned with the results of the current passive treatment units onsite and that the units are not treating contaminated groundwater as per the predictions of the models Water treatment units should be built to treat contaminated water and meet water quality standards We do not believe the site has the means of collecting data to ensure the units are performing per predicted modeling Broomfield is very

concerned with the Solar Ponds Plume Treatment System and questions if it meets the objectives of long term stewardship or current water quality standards It is unacceptable that modeling over a 100 year period indicates nitrate levels will continue to exceed 100 mg/liter The temporary standard will expire in 2009 which is after the 2006 closure and Broomfield worries funding will not exist during this time period and corrective actions will not occur The City on several occasions has voiced its concern with this matter and strongly believes DOE must look at alternative treatment systems to treat the Solar Pond Plume Nitrates breed algae blooms and we do not know the impacts of actinides and algae as migratory paths within the watershed

41 Page 100 Groundwater

The document states the 903 Pad/Ryan's Pit Plume will be monitored for natural attenuation and the plume is not migrating Define how data reflects contaminant migration is not occurring

42 Page 101 Groundwater

Each of the identified plumes in the document that is using natural attenuation as a means of treatment states in the event that ongoing groundwater monitoring indicates that the plume is migrating toward surface water additional mitigation may be required for this plume If new information is known after the 2006 closure date what will be the process for acquiring additional funding? Define the process for initiating corrective actions The City expects to be apprised of any water issues as soon as possible

43 Page 101 Solar Evaporation Ponds

Contaminants identified for the ponds include uranium nitrate and chromium Why are plutonium and beryllium not specified as contaminants? Has a complete characterization been performed underneath all five solar ponds? Please provide Broomfield with the data Broomfield requests more dialogue about the use of a single evapo transpiration cover for the ponds The ponds were RCRA units and the cap/cover will have to meet stringent RCRA closure criteria Does the proposed evapo transpiration cover meet the same criteria? Please provide the City with information related to the proposed caps such as where it has been deployed life expectancy engineering criteria identified deficiencies and comparison to normally used caps for CERCLA sites

44 Page 103 Original Landfill

Define the engineering criteria for the buttressing of the structure to maintain a cap on the steep slope of the landfill area What additional criteria will have to be maintained to ensure the integrity of the cap? Inspection criteria of the cap and buttress will have to be an integral part of the inspection checklist of the Original



Landfill area What additional erosion controls will be in place to maintain the integrity of the buttress? Erosion control measures are not captured in the budget

45 Page 103 Facility Foundations

Define some level of groundwater monitoring will be performed that is associated with the facility foundation throughout the long term stewardship period What additional analytes do DOE foresee being sampled? Define where and how the IASAP addresses facility foundations

46 Page 103 Contamination Specific Long Term Stewardship Activities sixth bullet

Define the timeframe for regular briefings to citizen groups It may be helpful to define the process now and finalize it at closure

47 Page 104 Contamination Specific Long Term Stewardship Activities

The document does not address Contingency Plans and they are crucial to stewardship activities Due to the life expectancy of the contaminants we know engineered controls will fail during the stewardship period and DOE needs to be proactive to protect human health and the environment Broomfield does not want to see personnel reacting to failures of engineered systems but rather be prepared for potential failure of the systems and act accordingly

48 Page 104 Contamination Specific Long Term Stewardship Activities

The document states specific long term stewardship activities for each media or specific sites have not been determined at this point Broomfield believes DOE should start to identify fixed activities now and as remedies are chosen the variable stewardship tools can be applied to solidify the activities and goals for long term stewardship Broomfield's ultimate goal is to protect the public and the environment

49 Page 104 Future Site Use

The City understands there is no legal requirement for DOE to maintain ownership of the site but DOE will forever be responsible and liable for contamination remaining at the site We are concerned the statement of not maintaining ownership of the site has been made several times within this document

March 15 2001

Tom Lukow  
U S Department of Energy  
Rocky Flats Environmental Technology Site  
Highway 93 Building 460  
Golden CO 80403 8200

Re National Defense Authorization Act (NDAA) Long Term Stewardship Report to Congress

Dear Mr Lukow

The City of Broomfield appreciates the opportunity to review and comment on the National Defense Authorization Act (NDAA) Long Term Stewardship Report to Congress addressing Rocky Flats Environmental Technology Site (RFETS) proposed long term stewardship plans and activities. Broomfield considers this document to be the foundation for the *Long Term Stewardship Plan* at RFETS. With remaining residual contamination onsite, Broomfield encourages a robust dialogue with stakeholders to ensure the site will remain in a safe configuration to protect human health and the environment for the life of the contaminant. The City staff has very thoughtfully and thoroughly reviewed this crucial document and has both general and specific concerns associated with this document.

**Transition between K H and New Subcontractor**

The City is concerned the transition from Kaiser Hill (K H) to the new subcontractor is not distinct. Broomfield understands U S Fish and Wildlife Service will not be responsible for the areas requiring long term stewardship activities. The management of site lands and natural resources is the responsibility of both the subcontractor and Fish and Wildlife. It is crucial to bring in the subcontractor prior to K H's exit to allow for an exchange of information and orientation. The City requests a draft plan citing the specifics of the transition process and key issues to be addressed during the transition period.

**Funding for Long Term Stewardship Activities**

The City has voiced concerns with the integration of D&D activities and ER activities to ensure the stewardship process is adequately being addressed. During this critical stage of closure, long term stewardship decisions are a crucial part of the remedy selection process. Broomfield is concerned stewardship funding is not recognized in the project baseline, nor are there identified project managers or personnel with which Broomfield can dialogue or address issues.

Mr Tom Lukow  
March 15 2001

or concerns pertaining to long term stewardship As the Site nears closure how will final stewardship decisions be made and by whom?

### **Removal of Sediment Ponds**

Broomfield is opposed to the approach of having passive water management systems (wetlands) in place of maintaining the sediment ponds Broomfield is concerned the proposed removal of the onsite sediment ponds and use of wetlands may provide a less effective method to manage surface water History of the ponds reflects the positive removal of sediments from water being stored in the ponds prior to discharge offsite If the ponds are breached and wetlands are anticipated to control migration of actinides what studies or modeling have been performed to ensure actinides will not migrate offsite? Broomfield requests more information with the use of wetlands within this area Please provide us with the following information 1) viability of wetlands with an arid climate 2) length of dormant period within this area 3) wetlands performance of sediment control during dormant periods 4) effectiveness of wetlands during and after a major storm event 5) active season for wetlands in this area 6) maintenance criteria 7) amount of water needed to maintain the proposed wetlands 8) source of water to maintain the wetlands and 9) success rate of revegetated wetlands within this area It is Broomfield's understanding that this issue and all water management issues will be discussed and resolved in the Water Working Group

### **Federal Ownership of the Site**

The City is concerned with the possibility of DOE not maintaining Federal Ownership of the site Several sections in the NDAA report elude to the fact DOE or any other federal entity may not maintain ownership of the land Broomfield contends DOE will always be responsible for any residual contamination remaining at the site for the life of the contaminants

### **Sampling/Monitoring Criteria**

Broomfield is concerned with the results of the passive treatment units onsite and that the units are not treating contaminated groundwater as per the predictions of the models The treatment units are to treat water to meet water quality standards and we do not believe the site has the means of collecting data to ensure the units are performing as well as other treatment systems Broomfield is very concerned with the Solar Ponds Plume Treatment System and questions if it meets the objectives of long term stewardship or current water quality standards It is unacceptable that modeling over a 100 year period indicates nitrate levels will continue to exceed 100 mg/liter The temporary standard will expire in 2009 which is after the 2006 closure and Broomfield worries funding will not exist during this time period and corrective action will not occur The City of Broomfield will continue to be part of technical working groups to guarantee the Integrated Monitoring Plan (IMP) is continually revised to ensure all sampling criteria is identified to meet the end state requirements As DOE drafts the Long Term Stewardship Plan Broomfield will continue to act as a team member to assist with the identification of points of compliance points of evaluation sampling criteria for surface water air groundwater and ecological monitoring

Mr Tom Lukow  
March 15 2001

**Security**

The NDAA report states that an annual physical inspection of the site will be required and the sampling team will perform the inspections. Annual inspections are not sufficient. Broomfield is concerned the sampling team will not have adequate equipment or knowledge to perform crucial physical inspections.

**Final ROD**

Broomfield understands final remedies have not been determined but DOE can start to generate a list of fixed long term stewardship tools and associated criteria that will be required in the final ROD. A well defined Contingency Plan will also have to be drafted to address potential deficiencies in engineered controls. The City wants to reinforce the need to have all stewardship activities and documents documented in the ROD.

In addition to these general comments, comments for specific sections of the NDAA report are provided in the attachment.

Thank you for the opportunity to comment on this crucial document. The City of Broomfield expects that we will continue to be involved, informed, and allowed to participate in the development of Rocky Flats Environmental Technology Site's Long Term Stewardship Plan. The City anticipates the formation of a long term stewardship technical group to address stakeholders' issues, concerns, and ideas. If you have any questions, please feel free to call me at 303 438 6329.

Sincerely,

*(Original signed by Shirley Garcia)*

Shirley Garcia  
Environmental Services

Attachment

Pc     Hank Stovall Broomfield City Council  
         Kathy Schnoor City of Broomfield  
         Mike Bartleson City of Broomfield  
         Mary Harlow City of Westminster  
         Steve Gunderson CDPHE  
         Steve Tarlton CDPHE  
         Tim Rehder EPA  
         Joe Legare DOE  
         Ken Korkia CAB  
         David Abelson RFCLOG

## DRAFT Focus Group Path Forward (through June 2001)

Meeting	Agenda
March 28	<ul style="list-style-type: none"> <li>• RFCA RSAL Working Group Update</li> <li>• Agenda Group Debrief                             <ul style="list-style-type: none"> <li>Focus Group Strategy (re RSALs and ER briefings)</li> <li>Approach for Task 1 Peer Review Response Discussion</li> </ul> </li> <li>• Integrated ER Decision Making Overview</li> </ul>
April 11	<ul style="list-style-type: none"> <li>• RSALs Regulatory Analysis (Task 1)                             <ul style="list-style-type: none"> <li>RFCA Parties Responses to Peer Review Comments</li> <li>Focus Group Summary of Task 1 Issues</li> </ul> </li> <li>• ER Stewardship</li> </ul>
April 25	<ul style="list-style-type: none"> <li>• RSALs New Science (Task 4)                             <ul style="list-style-type: none"> <li>Focus Group Summary of Task 4 Issues</li> </ul> </li> <li>• ER Surface Soils</li> </ul>
May 9	<ul style="list-style-type: none"> <li>• RSALs Model Evaluation (Task 2)                             <ul style="list-style-type: none"> <li>RFCA Parties Responses to Peer Review Comments?</li> <li>Focus Group Summary of Task 2 Issues</li> </ul> </li> <li>• ER Water</li> </ul>
May 23	<ul style="list-style-type: none"> <li>• RSALs Parameter Evaluation (Task 3)</li> <li>• ER Subsurface Soils</li> </ul>
June 7	<ul style="list-style-type: none"> <li>• RSALs Parameter Evaluation (Task 3)                             <ul style="list-style-type: none"> <li>RFCA Parties Responses to Peer Review Comments?</li> </ul> </li> </ul>

**PEER REVIEW OF  
COMPUTER MODEL SELECTION TO SUPPORT DEVELOPMENT OF  
RADIONUCLIDE SOIL ACTION LEVELS**

**Specific Areas Issues and Questions of Interest to the  
RFCA Stakeholder Focus Group**

**Revision 0 April 5 2001**

The Peer Reviewers should conduct an overall evaluation of the draft report. This overall evaluation should address the questions

- Is the approach for evaluating models for development of Radioactive Soil Action Levels (RSALs) at the Rocky Flats Environmental Technology Site (RFETS) sound and appropriate for the application?
- If the model evaluation approach is inadequate in any way, why is it inadequate and what approaches would be appropriate?
- Is the list of candidate models evaluated in the report appropriate for this site and application? Have any appropriate candidate models been excluded from the list (and why should they be included)? Have any inappropriate models been included in the list (and why are they inappropriate)?
- Is the analysis of models against evaluation criteria as presented in the draft report sound? If not, in what specific ways is the analysis incorrect?
- Are the conclusions of the model selection process supported by the analysis? Is the modeling methodology chosen appropriate for the site and application? If not, which approach would be a better choice and why?

The Peer Reviewers may also go beyond the questions listed above to review and discuss the merits of the document as they deem appropriate.

# **FROM WASTE TO WILDERNESS**

**MAINTAINING BIODIVERSITY ON NUCLEAR-BOMB-BUILDING SITES**

ROBERT H NELSON

April 2001

# FROM WASTE TO WILDERNESS

## MAINTAINING BIODIVERSITY ON NUCLEAR BOMB BUILDING SITES

Robert H. Nelson

### EXECUTIVE SUMMARY

The federal government spends around \$6 billion each year on a program to clean up and contain the remaining hazards at Department of Energy (DOE) sites that were used for developing and building nuclear weapons during World War II and its Cold War aftermath. Most analysts agree that much of the money spent for this purpose in the 1990s was wasted: the program made minimal progress in cleaning up the sites. Nonetheless, members of Congress competed to spend as much of the money as possible to create jobs and boost their local economies. The DOE nuclear waste management program is arguably the biggest boondoggle in all of current pork barrel spending.

The management of former nuclear weapons production sites is hindered by a complex and confusing set of federal and state laws. The laws seem to mandate restoring much of the area of nuclear production complexes to allow residential and other ordinary forms of land use in the future. In some cases, this goal is infeasible or exorbitantly costly given current technology. In other cases, it is undesirable as a matter of sound public policy.

Because of public safety and national security concerns, the federal government has tightly restricted access to nuclear weapons sites for 50 years. As a result, these sites—some of which are quite large—are unique in the United States in their isolation from ordinary impacts of human activity. Some of the flora and fauna found at them is rarely found elsewhere, including many species listed as endangered or threatened under federal and state laws. The current government attempts to clean up these areas overlook the environmental value of their rare ecologies. Indeed, under current policy, the federal government could spend many billions of dollars in an effort to rehabilitate some parts of the sites in order to allow for uses that would destroy valuable species habitat.

The federal government should abandon the current nuclear cleanup program as economically wasteful and environmentally counterproductive. It is time for a new form of stewardship strategy, emphasizing those steps necessary to protect public health from any actual threats posed by radioactive waste, while at the same time setting as a policy priority the isolation and conservation of DOE sites for their rich ecological diversity. Such a "waste to wilderness" strategy would give DOE a new flexibility to contain risks at existing sites at lower costs. It could save federal taxpayers many billions of dollars—perhaps as much as \$1 billion to \$3 billion per year. It would conserve some of America's most wild lands without requiring new federal measures to lock up additional multiple use land elsewhere.

Taxpayer advocates and environmental organizations can find common ground in the use of old nuclear weapons sites to protect wild and rare ecologies. The only losers would be government officials who administer the present cleanup program, short-sighted politicians, and local communities that desire pork barrel nuclear welfare.



# FROM WASTE TO WILDERNESS

## MAINTAINING BIODIVERSITY ON NUCLEAR BOMB BUILDING SITES

Robert H Nelson

### INTRODUCTION

The federal government spends around \$6 billion each year on a program to clean up Department of Energy (DOE) sites used for nuclear weapons development and production during World War II and the Cold War. More than \$50 billion has already been spent for this purpose over the past decade. Yet spending billions of dollars on environmental cleanup is not necessarily good for the environment. It can actually prove both economically wasteful and environmentally harmful.

This has happened before: consider the *Exxon Valdez* case. In 1989 the *Exxon Valdez* oil tanker spilled more than 10 million gallons of crude oil into the waters of Alaska's Prince William Sound. Pressed by the federal government, the state of Alaska, and environmental activists, Exxon launched a massive cleanup operation in an attempt to salvage its public image. Exxon spent about \$2 billion, much of it literally for scrubbing oil from fouled rocks and beaches. Within a few years, most analysts agreed that the *Exxon Valdez* cleanup had wasted much of this money and probably had done more environmental harm than good. The spraying of intense jets of hot water, widespread use of oil detergents, the physical impact of thousands of cleanup workers, and other aspects of the cleanup operation did significant damage to the shoreline ecology. It would have been better to leave nature to do the job alone.

Today the US government is engaged in its own environmental restoration and cleanup operation that may again be economically wasteful and environmentally harmful. Nuclear bomb building activities from World War II to the end of the Cold War left a legacy of widespread radioactive and other hazardous wastes deposited at numerous weapons production sites across the United States. The imperatives of winning the Cold War led the government to neglect environmental considerations in the nuclear bomb building effort. At one point in the 1950s, for example, radioactive transuranic waste was poured in liquid form directly into the ground at Hanford, Oak Ridge, and Los Alamos, leaving future members of the American public potentially exposed to dangerous substances by government carelessness in nuclear waste disposal.<sup>1</sup>

In the first half of the 1990s, as the bomb building needs of the Cold War receded, federal spending for risk containment and maintenance at existing

*The federal government spends \$6 billion each year on a program to clean up sites used for nuclear weapons development and production*

facilities and for cleanup of old nuclear weapons production sites escalated. In recent years, it has been maintained at about \$6 billion annually. This is the largest single area of direct federal spending for environmental protection, more than 30 times the direct spending by the government on the endangered species program. Yet many experts believe that the spending of vast sums of money at nuclear waste sites has succeeded mainly in maintaining the status quo.<sup>2</sup> It has averted any dangerous releases of radioactivity and potential exposure of human populations to significant risks, but little progress in cleanup has been made, and future prospects appear little better. Over the next 75 years, total costs to US taxpayers for maintenance and cleanup operations at former nuclear weapons production sites will likely exceed \$150 billion, and perhaps will be much more.<sup>3</sup>

Paradoxically, the nuclear bomb building sites—owing to the requirements of secrecy and protecting the public from radioactivity—represent some of the finest existing wild sites in America. Human impacts have been very minimal in many cases, since the sites were set aside for nuclear purposes. Under these special circumstances, endangered species and other plant and animal populations have thrived in many of these areas. If the current cleanup strategy continues, some of these existing wild areas are likely to face significant environmental damage. Federal taxpayers could end up spending billions of dollars in order to make lands available for other, less valuable uses. In the process, valuable wildlife habitat could be eliminated.

As happened in the *Exxon Valdez* cleanup, policymakers and others are failing to consider adequately the potential environmental damages of their own cleanup and management efforts at the nuclear sites. This is partly because politicians and various interests view cleanup campaigns as pork barrel spending projects. A 1998 report from Resources for the Future stresses that there are enormous political pressures from interest groups and local communities, expressed forcefully through their representatives in Congress, to use the nuclear waste program as a local jobs factory.<sup>4</sup> Indeed, at the height of nuclear weapons production in the 1960s, there were about 6,000 employees at the Hanford production facilities in Washington state. At the height of the cleanup effort in the 1990s, there were more than 15,000 employees trying to restore the Hanford site.

The overall cleanup program has demonstrated a robust ability to deliver jobs. A full five years after the 1989 close of the Cold War and the cessation of nuclear weapons production at major sites in the complex, contractor employment for environmental management activities had increased 7 percent nationwide to 136,000 workers.<sup>5</sup> A local newspaper in the Hanford area was moved to write of a vast river of money that Washington, DC, was sending to enrich the citizenry of eastern Washington state.<sup>6</sup>

Too many taxpayer dollars have already been wasted on such cleanup projects. The federal government should abandon the existing DOE cleanup and containment program as currently constituted. New program goals should be set. The federal government should pursue a policy to manage these sites to protect both public

*Spending billions on cleanup is not necessarily good for the environment. It can actually prove both economically wasteful and environmentally harmful.*

health and the ecological value of the sites. This policy will best be served by maintaining large areas of the sites for conservation purposes. Keeping these areas isolated will allow a new flexibility in the management of the parts of the nuclear complex that still contain the most dangerous residues of the old bomb building program. Under any likely strategy, the most contaminated areas at present will remain unfit for human occupancy for the foreseeable future.

Indeed, a policy of "waste to wilderness" would do more to conserve threatened ecological assets than most current environmental proposals. It would not involve large costs to achieve environmental goals, but might instead save the government billions of dollars. And unlike many such proposals, it would not require federal regulations to "lock up" multiple use lands or to infringe upon private property rights.

While it is difficult to know exactly how much the federal government could save by adopting the "waste to wilderness" proposal, there is no doubt that those savings would be substantial. As one indication of potential savings, DOE's 1996 *Environmental Management Baseline Report* sought to estimate the cost reductions from adopting a new and less ambitious cleanup strategy that addressed only existing risks to off-site populations and workers. Significant federal actions at the sites would still be required, but DOE estimated that this new strategy could reduce costs by 50 percent from their current levels.<sup>7</sup> Based partly on experiences with altered cleanup strategies at non-federal Superfund sites, economist Milton Russell has estimated that a new DOE strategy of less intensive cleanup could achieve cost savings of at least 33 percent below current spending levels.<sup>8</sup>

The proposal made in this paper could well achieve savings of this magnitude, perhaps a reduction of as much as \$1 billion to \$3 billion from the current \$6 billion annual spending. A "waste to wilderness" strategy could, over the long run, save US taxpayers more than \$50 billion.

### A LEGACY OF ENVIRONMENTAL ABUSE

The scientists and managers of the Manhattan Project—the US program to develop the atomic bomb during World War II—and their successors were preoccupied with the challenges presented by designing and constructing new reactors and weapons. The singular focus on supplying the Pentagon with nuclear weapons fostered a prevailing culture whereby production trumped safety and environmental concerns. Accordingly, the managers of the nuclear program paid less attention to the problems posed by accumulating radioactive wastes.<sup>9</sup> These attitudes persisted throughout the Cold War years. As former Idaho governor and longtime DOE critic Cecil Andrus recently put it: "All the pizzazz and sex appeal were up front—building bigger bombs, more bang, bigger reactors. No one paid any attention to the garbage coming out the back end."<sup>10</sup>

At the Hanford, Washington, and Savannah River, South Carolina, sites where the greatest amount of high-level radioactive waste was generated, federal

*The bomb building sites—owing to the requirements of secrecy and protecting the public from radioactivity—represent some of the finest existing wild sites in America*

*As in the Exxon  
Valdez cleanup  
policy makers are  
failing to consider  
the potential envi-  
ronmental damages  
of their own  
cleanup and man-  
agement efforts*

officials piped the hazardous liquid mostly into temporary underground storage tanks—many the size of an Olympic swimming pool. Appropriate action was to be taken at a later date.<sup>11</sup> Across the nuclear complex, the government initially disposed of transuranic wastes and low-level radioactive wastes in shallow burial grounds. Public officials also released millions of gallons of low-level radioactive liquids into seepage basins and sometimes directly into nearby streams.

DOE's predecessor, the Atomic Energy Commission (AEC), began in the late 1950s to take some preliminary steps to prepare high-level radioactive waste for some kind of long-term disposition. Beginning in 1957 at the Idaho National Engineering Laboratory (INEL), engineers constructed a calcination facility. In 1958, personnel at the Savannah River installation explored the feasibility of disposing of waste within tunnels drilled into the crystalline bedrock. Beginning in 1960, engineers at Hanford solidified high-level wastes and separated the most hazardous radionuclide constituents for ultimate disposal in a geologic repository. Hanford engineers also planned to permanently dispose of the solidified waste on site.<sup>12</sup>

Due to the production complex's national security exemption from external regulation, public officials conducted these waste management practices behind closed doors.<sup>13</sup> AEC periodically solicited recommendations from the academic or policy community, yet it discounted inconvenient advice. In 1961, the National Academy of Sciences (NAS) raised questions about AEC's approach and suggested that it consolidate disposal facilities at sites with favorable geologic characteristics. This suggestion, former DOE Chief Historian Richard G. Hewlett would write in 1978, was reject[ed] out of hand, adding that the overriding priority of the production program made that opinion unchallengeable.<sup>14</sup> When in 1965, NAS characterized the waste management program as ad hoc, more concerned with saving money than environmental integrity, AEC Chairman Glenn Seaborg referred to the report as unfavorable in an uninformed way, and soon thereafter dissolved the NAS committee.<sup>15</sup>

Despite AEC's best efforts to quash opposition to its waste management practices, by the early 1970s its plans for on-site disposal paths had proven politically untenable. Georgia Governor Jimmy Carter joined South Carolina Senator Ernest F. Hollings in denouncing the bedrock disposal plan at Savannah River. Giving weight to this political resistance was a very cautious evaluation of the option by the Environmental Protection Agency (EPA). By 1974, Congress removed the Savannah River on-site disposal project from the federal budget.

At Hanford, 15 tanks holding high-level radioactive materials were leaking by the early 1970s. The leaks were of little concern to Hanford engineers, reflecting a generally lax attitude toward radioactive releases. Moreover, the engineers were confident they could seal the tanks if necessary.<sup>16</sup> For the public and for state officials, however, the leaks suggested the federal government could not be trusted with the permanent disposal of high-level waste at the site. Plans for an on-site repository were subsequently shelved as well.

In the 1970s Congress made several changes in the organizational framework for the nuclear weapons production program partly reflecting changing priorities for the cleanup efforts. In 1974 the old AEC became the new Energy Research and Development Administration (ERDA) which was placed in 1977 in the newly formed DOE. Influences outside the nuclear establishment were beginning to penetrate the traditional secrecy of the nuclear program. A DOE internal history notes that by 1978 radioactive waste was now a major national issue and the White House and Congress had become lead players in determining policy.<sup>17</sup>

The second largest single component of the cleanup program estimated to cost anywhere from \$10 billion to \$25 billion is transuranic waste disposal.<sup>18</sup> Beginning in 1970 AEC began to separate transuranic and low level wastes. The transuranic waste would be packaged in retrievable storage containers awaiting a final disposition off site. In 1969 a fire at Rocky Flats had released plutonium into the environment. The prospect of large amounts of transuranic elements entering the environment galvanized public opposition to the storage of this type of waste at a site only 17 miles west of Denver.

Public concern spread to INEL to which the federal government had shipped portions of the Rocky Flats transuranic waste since 1954. The presence of Colorado's transuranic waste within Idaho borders emerged as a cause celebre among the Gem State's elected officials.<sup>19</sup> Public fears were fueled by several studies indicating that the transuranic waste stored at INEL posed a threat to the Snake River Aquifer—supplier of 20 percent of Idaho's drinking water and the source of water to irrigate many farms.

Senator Frank Church (D Idaho) successfully exacted a promise from AEC that within a decade the Commission would begin the process of removing all transuranic waste from Idaho.<sup>20</sup> It would be transported to a proposed repository in the salt mines of Lyons, Kansas. Yet by June of 1974 a combination of intense opposition from Congressman Joe Skubitz (R KS) and a series of unresolved technical questions forced AEC to terminate its plans for the Kansas salt mines. In 1976 ERDA began construction of a transuranic waste repository east of Carlsbad, New Mexico. This site, the Waste Isolation Pilot Plant, would also be plagued over the next two decades by a mix of political obstacles and lingering technical uncertainties that long delayed its opening.

### REINING IN THE NUCLEAR WEAPONS PRODUCTION COMPLEX

During the 1970s and 1980s environmentalists increasingly challenged the nuclear production complex's lack of external oversight. In a 1984 legal challenge the Legal Environmental Assistance Foundation, aided by the Natural Resources Defense Council, forced DOE to comply with the Resource Conservation and Recovery Act of 1976 at Tennessee's Oak Ridge Reservation's Y-12 plant. DOE's long-standing national security exemption from the nation's environmental laws was becoming untenable.

*A waste to wilder-  
ness strategy could  
over the long run  
save US taxpayers  
more than \$50 bil-  
lion*

*The singular focus on supplying the Pentagon with nuclear weapons fostered a culture whereby production trumped safety and environmental concerns*

During the latter half of the 1980s DOE gradually accepted an increased public role in its nuclear decision making. The process sometimes involved unusual twists and turns. In 1988 the FBI began flying over the Rocky Flats weapons facility often at night using infrared observation equipment to identify and document violations of the nation's environmental laws. In 1989 70 FBI agents raided Rocky Flats. The Bureau instructed DOE and contractor personnel to log on to their computers, open their file cabinets, and walk away from their desks as the FBI began a major investigation into violations of myriad federal and state environmental laws.<sup>21</sup>

In the negotiations over future environmental compliance of the bomb building program, some Rocky Flats officials reported that they were virtually willing to give the [EPA] anything it wanted out of fear of being jailed.<sup>22</sup> It was under these circumstances that DOE entered into its first tri-party agreement, a legal document signed by DOE, EPA, and state regulators that detailed how Rocky Flats would come into compliance with environmental law.

In full retreat now, DOE rushed into similar agreements with federal and state regulators at major sites throughout the nuclear complex. The natural inclination of regulators to apply the full extent of the existing law, reinforced by the states' incentive to tap the deep pockets of the federal government, produced long wish lists of cleanup actions. DOE's commitment to these legal agreements may sometimes have been less than fully sincere. The administration of George Bush the elder sought to portray its pick for Secretary of Energy, Admiral James D. Watkins, as "Mr. Cleanup" during his confirmation hearings. As John Tuck, then DOE undersecretary, comments, the agency was "dragged and prodded to consider the environment because to do otherwise might threaten the ability to supply the Pentagon with nuclear weapons." Tuck recalls that "we got into compliance agreements in my view because we had to stay in production to produce the requirements for the military." I never thought we would have adequate dollars to manage all of these compliance agreements.<sup>23</sup>

As the Cold War unexpectedly wound down following the 1989 fall of communism in Eastern Europe, DOE's new large-scale cleanup role proved to have some important side benefits. The nuclear weapons production complex employed many tens of thousands of people yet faced the loss of its traditional bomb building functions. Institutional survival meant the Department and its constituencies would need a new mission. Now turning almost 180 degrees, DOE embraced compliance with environmental regulations and promised to "close the circle on the splitting of the atom."<sup>24</sup> In 1990 the multi-billion dollar Environmental Management (EM) program was born. Its official mission was "to reduce health and safety risks from radioactive waste and contamination resulting from the production, development, and testing of nuclear weapons."

Accompanying the Department's new commitment to the environment were extraordinarily high costs. In 1993 DOE Assistant Secretary Thomas Grumbly warned Congress that the long-term cleanup bill could be as high as \$1 trillion. Even

after several large downward revisions total costs in 1996 were estimated at \$227 billion over a 75 year life cycle. More recently, responding to further pressures to reduce costs, DOE issued *The Accelerated Cleanup Plan* which pledged to complete the task for \$147 billion.<sup>25</sup> However, this latest plan faces an uncertain future because it has failed to gain support from some of the key parties while many site managers question its workability.

Critics argue that these budget estimates should be viewed with a large degree of skepticism. One DOE manager, Hunter Weiler, explained shortly before leaving the Department that he had long since stopped reading DOE's budget projections because the numbers were simply arbitrary.<sup>26</sup> During the period of FY1992 to FY1996, for instance, DOE's EM program budget rose by 57 percent—even while the long-run projected mean life cycle budget decreased by 65 percent.

Because compliance agreements at each site collectively provide an agenda for the cleanup program, the EM program's basic structure continues to closely reflect the institutional and political considerations that characterized the initial tri-party negotiations.<sup>27</sup> In Tuck's estimate, the development of the cleanup program was politics fraught with pitfalls that are not to be believed. The process pits state vs. state for cleanup money.<sup>28</sup> Some of the incentives are perverse. By heightening the complexity of the regulatory framework at sites, regulators increase DOE's expenditures and forestall any major reductions in, or closure of, the cleanup program. The less accomplished today, the more money available tomorrow. In the words of DOE personnel at the Oak Ridge Reservation in Tennessee, by fostering a backbreaking regulatory and bureaucratic structure, regulators force the federal government to spend money on and near the site.<sup>29</sup> It is a new form of never-ending nuclear welfare for the surrounding communities.

Economist Milton Russell of the Joint Institute for Energy and Environment, a policy group near the Oak Ridge Reservation, explains the dual motivations behind the robust regulatory agenda at the sites:

The DOE Environmental Management (EM) program by default inherited the Federal Government's obligation to communities and persons impacted by the decline in the DOE production mission. The EM program now had two tasks, not one. The only connection between the tasks was that money spent on remediation (mostly) flowed through host communities. Host communities and their political allies understandably seek to maximize this flow [of federal funds].<sup>30</sup>

Oak Ridge and its host community, according to Susan Gawarecki, Executive Director of the Oak Ridge Reservation Oversight Committee, were among the few sites willing to consider risk in any kind of realistic way. However, as she notes, "because we have not been irrational, Oak Ridge has not attracted the national attention (and budget money) bestowed on sites where anti-nuclear activists make exaggerated claims of environmental and health effects. Indeed

as Gawarecki notes since 1995 Oak Ridge's EM budget has declined by 23 percent while the overall EM program has shown a modest increase nationally. At the Savannah River site DOE's financial contribution to the host community in FY1996-97 exceeded that of FY1987-88 despite the end of the Cold War.<sup>31</sup>

Such political and bureaucratic considerations have created a program lacking clear goals or focus. In a 1995 report on the Hanford site commissioned by Congress, former DOE employees Steve Blush and Tom Heitman told the nation's lawmakers that the mission of cleaning up the site has gotten lost in the legal and regulatory framework that governs it. The existing framework demands compliance with every regulation regardless of whether compliance would conflict with some important public health priority.<sup>32</sup>

With federal and state agencies toiling in regulatory labyrinths designed to attract money to the sites, the implementing private contractors—as one high level official at DOE headquarters recently put it—are laughing all the way to the bank.<sup>33</sup> Poorly planned projects, prolonged debates over regulations and disposal paths, and DOE employees adrift in a bewildering sea of leadership and management changes all successfully keep the money flowing to private firms.<sup>34</sup> A web of political contributions in Washington and a revolving door culture ensures that a select group of firms receives immensely lucrative contracts regardless of repeated technical and managerial failures.

Gridlock means that much of the budget at DOE sites is absorbed for what has come to be called "baby sitting" or "hotel management." A former DOE overseer of the EM program, Alvin Alm, explained this phenomenon to Congress in 1996, stating that the majority of EM funds are spent just to open the doors of the facilities every day and keep them in a safe and stable condition. Alm, as well as others within DOE, estimated that nearly 60 percent, or \$3.6 billion, of the \$6 billion annual budget is devoted to maintaining the sites. Alm considered in 1996 that "these mortgage costs are eating us alive."<sup>35</sup>

Because of the large public expenditures required to maintain the facilities, considerable focus has been given to expediting the pace with which DOE moves toward its final cleanup. This concern helped stimulate the Department's 1998 report, *Accelerating Cleanup: Paths to Closure*.

The DOE plan was coolly received by many of the groups most directly affected or actively involved in the public debate. A coalition of community organizations located near sites throughout the complex has urged DOE to discontinue it. Distressed by, among other things, unrealistic assumptions, the organizations criticized the artificial and impractical budget and schedule.<sup>36</sup> Energy Secretary appointee Bill Richardson spoke of a new National Cleanup Initiative at his confirmation hearings, but failed to mention the accelerated cleanup.<sup>37</sup>

In a series of interviews, managers at major sites across the complex expressed skepticism that the plan's reliance on efficiency gains would allow them to address



so called compliance gaps —the difference between what is legally required by agreements with the states and the magnitude of federal budgetary assumptions. One manager for instance said the gap will put us in court with state regulators<sup>38</sup> while another commented that we have squeezed all we can from this orange<sup>39</sup>. Without a basic change in cleanup strategy the widespread management failures of the past are likely to continue unresolved.

## FROM NUCLEAR WASTELAND TO WILDERNESS

The *Financial Times* recently described what has become one of the wildest areas in Europe:

Eastern Europe has a splendid new nature reserve rich in wildlife and luxuriant with vegetation. It has an astonishing 270 species of birds, 180 of which nest there. Wolves, wild boar and elk are just a few of the mammals roaming the forests, and the lakes and rivers teem with fish. There are more than 40 rare plants and animals recognized internationally as endangered species.

Unfortunately, you have no chance of visiting this natural wonderland as a tourist. It is the Chernobyl Exclusion Zone, set up after the world's worst nuclear accident in 1986 to keep people out of the most radioactive area within 30 km of the stricken reactor.<sup>40</sup>

Low levels of radioactivity do not necessarily have a negative impact on biodiversity. For example, Ronald Chesser, a radiobiologist at the Savannah River Ecology Laboratory, has conducted research near the Chernobyl site in the Ukraine. Recently asked by DOE officials to assess the impact of the Chernobyl accident on the wildlife populations in the area, and similar to the report above, Dr. Chesser declared that it was surprisingly positive.<sup>41</sup>

Given all the federal mismanagement of the cleanup activities at the old US nuclear complex and the presence of so much old radioactive material, one might think the lands would be unsuitable for most forms of life. However, like the area around Chernobyl, many of these sites ironically have become sanctuaries for wildlife. The United States nuclear bomb builders went to great lengths to ensure that unauthorized citizens did not enter most parts of these areas. It would be a potential breach of national security if an unknown person somehow gained entry to the wrong place. Partly as a result, much of the nuclear weapon complexes' 2.1 million acres—an area in size larger than the states of Delaware and Rhode Island combined—offered protection to wildlife in a manner found at few other places in the United States. Ward Whicker, a radioecologist at Colorado State University, reports that the flora and fauna on nuclear complex lands are absolutely thriving as a result.<sup>42</sup> Radiation levels have declined in many areas, and even where low levels remain, in almost all cases, all indicators (diversity, productivity, life span) are higher for the plant and animal populations within the old nuclear complex.<sup>43</sup>

*One DOE manager explained shortly before leaving the Department that he had long since stopped reading DOE's budget projections because the numbers were simply arbitrary.*

*By heightening the complexity of the regulatory framework regulators increase DOE's expenditures and forestall any major reductions in or closure of the clean up program*

u Local hunters marvel today at abundant turkey populations foraging along the boundaries of the Oak Ridge Reservation. The turkeys coexist with more than 40 state classified endangered, threatened, rare, or special concern species. The Oak Ridge Reservation has become the most important wildlife preservation area in Tennessee and is home to peregrine falcons, cerulean warblers, and other rare animal species.<sup>44</sup>

u The Hanford Reach of the Columbia River, which flows east across the site before turning more directly south to form the reservation's eastern boundary, extends 51 miles. It is the last major spawning ground for salmon on the main stem of the Columbia. Identified by the US Fish and Wildlife Service as one of the two most important wildlife habitats in the state of Washington, the upland shrub steppe wilderness of Hanford is being studied by The Nature Conservancy (TNC). To date, TNC has discovered numerous ecologically valuable plant and insect species. In all, more than 200 bird species are found within Hanford's boundaries. The site provides habitat for the Aleutian Canadian goose, the bald eagle, and the peregrine falcon, which are listed federally as threatened species. Some 6 mammals, including otter, muskrat, mink, beaver, and bobcats, coexist with over 250 native plant species. We resort of [an] island ecologist Larry Cadwell of Battelle Northwest observes of the Hanford nuclear complex, sort of a last bastion of sagebrush dependent species.<sup>45</sup>

u In 1949, AEC took possession of 890 square miles of the Snake River Plain in Idaho to construct experimental reactors, including the Navy's first prototype nuclear propulsion plant. Today, the INEL site contains a bounty of antelope, which, during the winter months, constitutes more than 30 percent of Idaho's pronghorn population. INEL is home to some 40 different species of mammals. Nearly 200 bird species live within the site's boundaries, including sage grouse, mourning doves, ferruginous hawks, burrowing owls, and prairie falcons. Four species found at INEL are listed federally as endangered or threatened.

u The Savannah River site is one of the largest contiguous tracts of wild area east of the Mississippi. Local personnel speak of a modern-day Davey Crockett who until recently made a living trapping animals for fur just outside the boundary. Five rivers flow among the Savannah River site: loblolly pine, longleaf pine, oak, ash, maple, and gum trees, and eventually come together in a 30,000-acre wetland. Here there are cypress, tupelo, Spanish moss, and other wetland vegetation. In all, the Savannah River site is home to more than 50 different mammal species, 100 varieties of freshwater fish, and over 200 species of birds. Federally listed species under the Endangered Species Act include the wood stork, red cockaded woodpecker, and shortnose sturgeon.

u In 1951, AEC began setting aside nearly 10 square miles of grasslands and shallow canyons just outside Denver to manufacture triggers for the nuclear arsenal. Kent Brakken, a biologist who earned his doctorate at the University of Colorado in nearby Boulder, calls the buffer zone of the Rocky Flats installation an island of refuge and sanity.<sup>46</sup>

Because the Rocky Flats installation lies along the boundary of two distinct ecosystems the Great Plains from the east and the Montane biome from the west there is extremely high diversity <sup>47</sup> Where the flat irons buckled under pressure as they collided with the Montane biome many years ago shallow canyons nurture wetlands and hillside wildflowers in unusual profusion In these canyons the endangered preble mouse—officially designated unique by the Colorado Department of Natural Heritage—resides Unusually large mule deer including bucks with 30 inch racks are protected at the site along with coyotes mountain lions and other species

*Low levels of radioactivity do not necessarily have a negative impact on biodiversity*

The coexistence of nuclear materials dispersed low level radioactivity and abundant wildlife populations raises a surprising conflict among environmental objectives Environmentalists have frequently held that the nuclear cleanup program should restore the old production sites to an original condition with no more than a natural background level of radiation However this approach may undermine the current conservation and biodiversity values of the land The regulatory regime at the nuclear sites Rebecca Sharitz of the Savannah River Ecology Laboratory notes is focused on contamination removal rather than acting to support self sustaining ecosystems <sup>48</sup> In a 1993 study Whicker and two colleagues observed that the stringent application of current environmental regulations

would likely be welcomed locally because of the jobs and economic stimulation it would provide In general the public and their elected officials tend to favor local cleanup projects because of the economic benefits and the sometimes superficial appearance that such activity is for a noble cause We believe the US is largely unaware of the costs to the taxpayer and the ecological devastation and loss that could result from unnecessary cleanup of a valuable ecological resource <sup>49</sup>

(A similar paradox where military actions have created a valuable environmental asset exists on the Korean peninsula The demilitarized zone between North and South Korea is the only real wilderness in the entire area of the two countries As North and South Korea seek diplomatic accommodations efforts are being made to ensure that the demilitarized zone will be maintained in its current ecological condition )

Although there are more than 130 sites in the US nuclear weapons complex five are expected to account for more than 70 percent of total cleanup and containment costs Oak Ridge in Tennessee Hanford in Washington state Savannah River on the border of South Carolina and Georgia Rocky Flats in Colorado and the Idaho National Engineering Laboratory Paradoxically the presence of radiation danger and national security concerns have meant that these very same places offer some of the finest and least disturbed plant and animal habitats in the United States It is time for Congress to adopt a cleanup strategy that takes clear and full account of this reality

## FOUR PRINCIPLES

The laws that govern the management of nuclear wastes at the former weapons complex were written for other places and purposes such as cleanup of chemical and other ordinary industrial hazards. The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA better known as Superfund) and the Resources Conservation and Recovery Act of 1976 (RCRA) were only belatedly applied to the old nuclear bomb building sites.<sup>50</sup> The objectives driving these laws reflected the simple idea that responsible parties (in the case of the nuclear sites the federal government) should restore the land to a near pristine condition that preceded contamination. The laws do not envision the possibility that the more recent nuclear management of the lands may have changed their condition in an environmentally beneficial way. It is not recognized that the existence of moderate levels of radioactive danger and the long standing exclusion of people may have created a situation of large (if unplanned) existing benefits for wildlife diversity. It probably never occurred to most legislators that current restoration of nuclear sites in some cases might actually end up doing more damage to the environment.

*The coexistence of nuclear materials dispersed low level radioactivity and abundant wildlife populations raises a surprising conflict among environmental objectives*

At the Rocky Flats installation near Denver the nearby town of Superior supports a cleanup of the land to meet a hyper stringent soil standard for radionuclides. The town has proposed the construction of a new strip mall there complete with a Loaf n Jug a western competitor to 7-11. Other development proposals abound including one for a golf course. The various development proposals would displace the existing habitat which is more favorable to many plant and animal species.

If Superior had to pay for the cleanup the costs would greatly exceed the financial benefits of any new stores housing or other standard development projects. If Superior residents or a prospective developer had to pay for the cleanup that would be meeting a market test. Indeed were the federal government to transfer DOE sites and any attendant liability to willing private parties (a reverse Dutch auction has been suggested) taxpayers would be off the hook for these wasteful projects. Private incentives would be able to function normally. As things stand however there is no reason for federal taxpayers to spend billions to clean waste sites to meet unreasonable Superfund and RCRA cleanup standards and then needlessly disrupt valuable species habitat.

This paper proposes an alternative goal for the future management of the nuclear weapons complex. The waste to wilderness proposal would achieve a win-win outcome both reducing costs to federal taxpayers and acting to achieve greater conservation of the existing ecological values of DOE sites. The proposal rests on the following four principles:

*1) Explicitly recognize the high ecological value of old DOE bomb building sites in their current condition in the conduct of future program planning*

Regulators and other involved parties currently are directed to consider future land use across the complex within the Superfund and RCRA framework. The various parties typically evaluate future risks to human health based on the assumption that the sites will accommodate industrial, recreational, or commercial uses. As a result, the best environmental outcome often becomes a costly and in many cases ecologically harmful full cleanup. The law does not provide for the consideration of using the land for conservation and biodiversity purposes. In the context of the secluded, ecologically rich weapons sites, this omission may arbitrarily preclude what may well be the current highest value use of the land. Although efforts are now finally being made to give greater consideration to stewardship strategies, they lack a clear statutory basis and an explicit recognition of the full ecological potential of these sites.<sup>51</sup>

## *2) Minimize actual risk to off site human populations*

At present, the public does not come in contact with many parts of DOE waste sites. For these sites to be hazardous to human health, humans must become exposed to contamination. Should existing restrictions on access continue, the current hazardous wastes in the nuclear complex likely pose no significant public health risk. As DOE stated in 1997, aside from a few urgent risks, most hazards at these sites present little imminent risk because physical and institutional controls greatly limit public access to the sites.<sup>52</sup> As we now do with orphan Superfund sites, it may make more sense to maintain the facilities without attempting further extensive cleanup and then simply fence off large portions from future public access. Recognizing the pressures that recreational use can place on the land, such sites will be more wilderness than wilderness.

## *3) Recognize that long term cleanup requires technological advance*

It will still be necessary to take some preventative and maintenance actions to stabilize waste and contamination on site in the short run. In the long run, the waste to wilderness proposal offers the flexibility to allow for technological innovation to provide improved solutions. As the General Accounting Office noted in 1994, developing less costly and more effective cleanup technologies may be the only way the nation can afford to clean up the vast amounts of waste generated by the nation's nuclear weapons complex.<sup>53</sup> The federal watchdog agency considered present actions as often ineffective, extremely expensive, and offer[ing] only short term solutions.<sup>54</sup> Similarly, a 2000 report by the National Academy of Sciences declared that at most of DOE's waste sites, complete elimination of unacceptable risks to humans and the environment will not be achieved now or in the foreseeable future. This is partly because the present tools available for these purposes are of doubtful technical effectiveness.<sup>55</sup> The Academy called for a major rethinking of strategies for future management of nuclear waste sites, following a more incremental and adaptive approach.

Rather than maintain the illusion that current technologies will provide a final solution, it is more appropriate to think of nuclear or other cleanup efforts as a series

*Laws that govern the management of nuclear wastes at the former weapons complex were written for other places and purposes such as cleanup of chemical and other ordinary industrial hazards*

of short term remedies. The government may decide in the short term to leave the land as it is, then perhaps make other decisions about future uses when technological or other conditions may provide new and more favorable options. On a few occasions DOE and its regulators have explicitly embarked on interim cleanup actions designed to stabilize the hazard in the short term when no viable technological remedy presented itself. These initiatives are worthwhile, but they have had a small overall impact so far: they represent tinkering at the margins—a patch of land here, a pond there—while the greater program failings continue. The waste to wilderness proposal builds in a much more comprehensive fashion upon this insight that future technology may afford cheaper, better remedies.

*4) Enable stewardship at DOE sites to conserve ecological value and protect public health*

In an internal draft document of September 1997, DOE officials acknowledged hazards will remain after cleanup at most sites, while adding that, without long term stewardship, these hazards could result in unacceptable risks to human health and the environment.<sup>56</sup> Indeed, under current technological constraints, the presence of radioactivity and other hazards over significant parts of the sites will require a continued restriction of public access. This reality conflicts with the Department's long standing official communications with the public. For example, former DOE Secretary Frederico Pena, in presenting the FY 1999 annual budget request before the Senate, spoke of the Department's commitment to "clean up our sites and return them for among other uses, economic development."<sup>57</sup> The federal government needs to acknowledge more widely and explicitly to the American public that given current standards, cleaning up and returning the sites is not always a cost effective option, and a continuing federal stewardship of sites with radioactive hazards may be necessary for many years to come.

The Department has begun to take some steps in these directions, more fully acknowledging recently the need for long term stewardship of the sprawling complex. In *From Cleanup to Stewardship*, released in October of 1999, DOE officials recognize that, "Depending on the nature of the contaminant and the medium in which it is found, there are several limitations and challenges that preclude remediating many DOE sites to levels that would permit residential or other unrestricted land uses."<sup>58</sup> Indeed, fully 76 percent of the sites will require institutional controls to restrict public access in the foreseeable future.<sup>59</sup> This fundamental realization fully supports a biodiversity and ecological protection set of goals for the land—an agenda that should rightfully displace the economically wasteful and currently dominant regime of pork barrel economic development. DOE needs to take steps now to reduce sharply the extravagant spending levels of the past that have been justified to the American public by the stated goals—however impossible to realize—of total site cleanups.

## A FUNDAMENTAL DEPARTURE

These four principles provide the foundation for a radical departure from the current DOE cleanup regime. The Environmental Management program, though only a decade old, was forged as a set of politically expedient compromises that would allow DOE and its predecessor agencies to continue in their primary lifetime mission: nuclear weapons work. Today, despite the glaring inadequacy of the EM program, politicians, private contractors, and nearby communities perpetuate the problem because they desire the political and economic benefits. The program continues in its current form mainly because it provides jobs and salaries for more than 100,000 workers, many of whom would have to move to other areas of the United States if the current array of cleanup employment were not available.

There are precedents for the wilderness stewardship strategy proposed here. From 1942 until the end of World War II, the Army produced a plethora of chemical weapons, including mustard gas, white phosphorus, and napalm, at the Rocky Mountain Arsenal, 10 miles on the other side of Denver from Rocky Flats. The end of World War II allowed the Army to lease the land to private industry. From then until 1982, a private party used the site to produce agricultural pesticides, despite considerable residual chemical contamination.<sup>60</sup>

An example at the Savannah River site also illuminates the desirable outcomes that can occur when thinking shifts from redressing a liability to preserving an asset. During Savannah River's bomb production years, the Par Pond served as a reservoir for water being discharged from reactors, allowing the boiling water to dissipate heat before being released to the Savannah River. In this capacity, sediment in the Par Pond became contaminated with low levels of Cesium-137 and Strontium-90, as well as some transuranic elements.

In 1991, the federal government partially drained Par Pond. Thirteen hundred acres of sediment were exposed as a result, and EPA designated the area as a Superfund Operable Unit. Using Superfund's residential land use assumption, federal regulators determined that a full cleanup under the Superfund risk standard was necessary. The risk to the local biota, however, was minimal from the remaining radioactivity.

To reach the human health standards mandated under Superfund, it was estimated the remediation effort would cost in excess of \$1 billion. Additionally, the cleanup would cause ecological devastation.<sup>61</sup> As a result, the Savannah River Ecology Laboratory strongly opposed the remediation project, favoring maintenance of a weakened dam and refilling Par Pond. The total cost associated with this approach to remediation was estimated to be \$10 million to \$14 million, a tiny fraction of the cleanup costs required under standard Superfund procedures.

Under the waste-to-wilderness proposal, such approaches would no longer be exceptions reached after years of controversy. Instead, the approach of ecological maintenance of old nuclear sites would be the initially preferred stewardship

*A new stewardship strategy with the explicit goal of maintaining attractive ecological conditions would create a greater flexibility in managing the most contaminated areas*

*Little actual  
cleanup at the  
nuclear sites has  
occurred despite  
the expenditure of  
many billions of  
dollars for this  
stated purpose*

approach Managers would have two well defined goals preserve the ecological asset on site while protecting the American public from any adverse health or other negative impacts off site (or in any unavoidable on site visits) Managers would take remedial action when on site conditions have the potential for doing harm to people living off site or who are not able to avoid exposure to radioactivity

The approach recommended here does not eliminate all burdens For the foreseeable future the federal government will have to bear the significant costs of managing these sites to contain the existing nuclear residues and other hazards These sites are the product of a uniquely federal activity constructing the nuclear weapons of the Cold War era However the federal government might well sub contract or otherwise delegate day to day operating responsibility for the sites to states local governments or private organizations (such as local land trusts or perhaps a profit making firm) If the federal government retains management control existing agencies (such as the Fish and Wildlife Service or the Bureau of Land Management in the Interior Department) might perform the actual management The long run goal once the radioactive waste issues have been resolved (perhaps with technologies unknown today) should be to transfer these sites to private ownership If they are still most valuable in ecological use at that time non profit organizations could be expected to be among the high bidders

## CONCLUSION

Since 1945 the United States has spent more than \$5 trillion to build and operate a nuclear arsenal of more than 70 000 weapons The need to build further nuclear weapons largely ended with the end of the Cold War An important task now is to decide how to use and manage the former bomb building sites of the nuclear weapons complex

This task has been greatly complicated by the application of an inappropriate set of federal and state laws never intended for this purpose The laws direct DOE to achieve goals that are technically impossible to realize in many cases Even if they were technically feasible they would often be economically wasteful and undesirable Rather than make the old weapons production sites available for various forms of new residential commercial or other ordinary development as current law seems to require the federal government should incorporate conservation and biodiversity options as well A new stewardship strategy with the explicit goal of maintaining attractive ecological conditions throughout old bomb building sites would create a greater flexibility in managing the most contaminated areas This would often allow for much lower costs than current stricter cleanup plans

Lacking any sound direction from Congress the courts or the executive branch the various players in the system today are simply seeking to maximize their own advantage The states have enjoyed massive inflows of pork barrel spending DOE bureaucrats have had high paying and secure jobs and private contractors have obtained large revenues All the while little broader public



benefit has resulted. Maintenance has been sufficient to protect the public health from the hazards now present at most existing facilities. But little actual cleanup at the nuclear sites has occurred despite the expenditure of many billions of dollars for this stated purpose.

Like the beaches fouled by the oil from the *Exxon Valdez*, sometimes the environmentally and economically preferable course of action is to do little or nothing. In the case of the former nuclear weapons production complex, some heroic actions may still be necessary under any strategy to stabilize waste and contamination. However, spending many billions of dollars in some areas will have the main impact of opening up low value land uses in areas of the nuclear complex where it would destroy the most environmentally valuable functions of these sites. Adopting the waste to wilderness proposal would save taxpayers tens of billions of dollars over the long run while providing greater protection of wilderness values than any pending proposal to lock up multiple use land. As such, it represents the sort of win-win solution that should be more widely sought but is rarely achieved in environmental policymaking.

## NOTES

Mark Holt *Nuclear Weapons Production Complex Environmental Compliance and Waste Management* Congressional Research Service January 17 1997 p 4

Katherine N Probst and Michael H McGovern *Long Term Stewardship and the Nuclear Weapons Complex The Challenge Ahead* (Washington DC Resources for the Future 1998)

Katherine N Probst and Adam I Lowe *Cleaning Up the Nuclear Weapons Complex Does Anybody Care?* (Washington DC Resources for the Future 2000) p 2 See also US Department of Energy Office of Environmental Management *Accelerating Cleanup Paths to Closure* (June 1998)

Probst and McGovern *Long Term Stewardship and the Nuclear Weapons Complex* p 22

Probst and Lowe *Cleaning Up the Nuclear Weapons Complex* p 15

Karen Dorn Steele Hanford *The Spokane Spokesman* four part series November 13 1994

DOE The Baseline Environmental Program at a Glance [www.em.doe.gov/bemr96/atglance.html](http://www.em.doe.gov/bemr96/atglance.html) posted August 13 1996

Milton Russell *Toward a Productive Divorce Separating DOE Cleanup from Transition Assistance* (Knoxville Tennessee Joint Institute for Energy and Environment 1997) p 10

Alvin M Weinberg *The First Nuclear Era The Life and Times of a Technological Fixer* (New York American Institute of Physics Press 1994) p 183

Quoted in Idaho says US failed miserably on nuclear waste *Denver Post* February 22

National Academy of Sciences report released in the early 1950s quoted in Arjun Makhijani *High Level Dollars Low Level Sense* (New York Apex Press 1992) p 137

In a 1978 paper Federal Policy for the Disposal of Highly Radioactive Wastes from Commercial Nuclear Power Plants DOE Chief Historian Richard G Hewlett writes A policy for the defense wastes at Hanford was all but an accomplished fact The Commission had also assumed that the Savannah River would also be disposed of on site report made available through DOE History Division Office of the Executive Secretariat Washington DC p 14

Steele Hanford

Hewlett Federal Policy for the Disposal of Highly Radioactive Wastes p 9

F G Gosling and T R Fehner *Closing the Circle The Department of Energy and Environmental Management 1942 1994 History Division* (draft) (Washington DC Executive Secretariat DOE March 1994) p 15

Hewlett Federal Policy for the Disposal of Highly Radioactive Wastes p 25

Gosling and Fehner *Closing the Circle* p 26

The generation of transuranic waste dates as far back as the operation of plutonium production reactors and chemical processing plants during World War II under the Manhattan Project These wastes were included in the low level category until 1970 They were then given a separate classification as transuranic wastes owing to the presence in such wastes of particularly long lived radioactivity (the rate of decay was very low for some of the components) Because of the very long lifetime and expected persistence during this period of some degree of nuclear waste hazard there was a new recognition of a need to separate the disposal and treatment of transuranic wastes from ordinary low level wastes See US DOE *Buried Transuranic Contaminated Waste Information for US Department of Energy Facilities* (June 2000)

Gosling and Fehner *Closing the Circle* p 15

Ibid

The grand jury that reviewed the case found a culture of criminal misconduct within the Rocky Flats installation However the Justice Department blocked the jury from issuing indictments The controversy continued throughout the 1990 with the jury seeking the representation of George Washington Professor of Law Jonathon Turley

See General Accounting Office's *Department of Energy National Priorities Needed for Meeting Environmental Agreements* (RCED 95 1) 1995

Ibid Bill White deputy secretary during Clinton's first term supports Tuck's version of events White has characterized the former administration as taking a very cynical view of these environmental agreements considering them a necessary evil to keep production going Indeed Admiral Watkins observed as he was entering into the agreements that they would have the effect of committing the Department's resources beyond funds that are currently available

Thomas Grumbly a former assistant secretary for environmental management considered in 1993 Our mission at the Department of Energy is no less significant than trying to close the circle on the splitting of the atom begun a half century ago by [the Manhattan Project]

DOE Office of Environmental Management *Accelerating Cleanup Paths to Closure* (1998) p 5 In a *March Status Report on Paths to Closure* DOE revised this life cycle estimate to between \$151 billion to \$195 billion This document is available at [www.em.doe.gov/doclistb.html](http://www.em.doe.gov/doclistb.html)

Interview with Hunter Weiler November 1996 This interview as well as others done for this study and quoted below was conducted by Ethan Brown a former graduate student in the School of Public Affairs at the University of Maryland

Many agreements have been re negotiated. However precedents set in the first agreements remained important factors during these negotiations.

As quoted in *The Denver Post* March 1 1994

Interview with DOE Oak Ridge personnel May 1998

Milton Russell *Toward a Productive Divorce* p 2

DOE remains the single largest manufacturing employer in the state of South Carolina

Steve Blush and Tom Heitman *Trainwreck Along a River of Money* available through DOE Environmental Management Office Public Affairs Washington DC 1995 p 4

Interview with DOE employee Headquarters October 1997

For more on the organizational structure and decision making within the EM program see the National Academy of Science's *Barriers to Science: Technical Management of the Department of Energy Environmental Remediation Program* (1995). See also the National Research Council *Improving the Environment: An Evaluation of DOE's Environmental Management Program* (1995).

As quoted in *Alm's Goal Jibes With Managers Plans* *Inside Energy with Federal Lands* June 10 1996

Letter from the Military Production Network dated October 8 1997. As quoted in *Groups Say 2006 Plan is not Salvageable* *Inside Energy with Federal Lands* October 3 1997

Such changes in leadership and direction have led at least one DOE employee to quip: Plans are Us.

Interview with INEL EM manager July 22 1998

Interview with Hanford EM manager August 12 1998

<sup>40</sup> Clive Cookson *Back to the wild on Chernobyl's wastelands* *Financial Times* October 21/22 2000

Interview with Dr. Ron Chesser at the Savannah River Ecology Laboratory February 4 1998

Telephone interview with Dr. Ward Whicker June 3 1998

Whicker elaborates in specific reference to radionuclides in the natural environment throughout the nuclear complex: If we restrict ourselves to radioactivity rather than other contaminants, it is rather clear that it takes very high levels of radioactivity to cause ecological impacts that we can see. I don't know of anywhere in the DOE complex where radioactive contamination is making it difficult for plants and animals to maintain themselves.

<sup>44</sup> Kathryn S. Brown *'The Great DOE Land Rush'* *Science* October 23 1998 p 616

As quoted in *Hanford Habitat Key to Survival* *The Tri-City Herald* three part series February 25 28 1996

Interview with Dr. Ken Brakken June 22 1998

*Ibid*

Interview with Rebecca Sharitz January 1998

F. W. Whicker, T. G. Hinton, and D. J. Niquette *To Remediate Or Not: A Case Study* *Environmental Health Physics Research Enterprises Publishing Segment* p 483. Proceedings of the 26th Midyear Topical Meeting of the Health Physics Society, Coeur d'Alene, Idaho, January 24-28 1993. Sponsored by the Columbia Chapter Health Physics Society, Richland, Washington.

For a critique of the federal Superfund program see James V. Delong *Superfund XVII: The Pathology of Environmental Policy* (Washington, DC: Competitive Enterprise Institute, August 1997).

See US DOE Office of Environmental Management *From Cleanup to Stewardship* (October 1999) and US DOE Office of Environmental Management *Long Term Stewardship Study* draft for public comment (October 2000).

The Department's conclusions are based on a study conducted by the Consortium for Environmental Risk Evaluation (CERE). In 1995, CERE told Congress the greatest potential for significant risks to workers, to the public and nearby tribes, and to ecological receptors lies largely with the inventories at the installations of plutonium, spent nuclear fuel, and nuclear wastes. CERE's remarks stem from a review of over 1,600 separate risk-related documents at major sites within the complex. The study is considered the most comprehensive analysis of DOE-related risks to date. For further information see CERE's *Health and Ecological Risks at the U.S. Department of Energy's Nuclear Weapons Complex: A Qualitative Evaluation* *CERE Interim Risk Report* March 1995, available through the Environmental Management Office Information Center, Washington, DC.

US General Accounting Office *Management Changes Needed to Expand Use of Innovation and Cleanup Technologies* RCED-94-205 1994.

*Ibid*

National Research Council *National Academy of Sciences: Long Term Institutional Management of U.S. Department of Energy Legacy Waste Sites* (Washington, DC, August 2000) pp ix-4.

DOE *Moving from Cleanup to Stewardship* (draft) prepared by the DOE's EM Program Office of Strategic Analysis, Washington, DC, September 17 1997 p 1.

Frederico Pena as quoted in a statement of James M. Owendoff, acting assistant secretary for environmental management before the Strategic Forces Subcommittee, Armed Services Committee, United States Senate, March 12 1998.

DOE *From Cleanup to Stewardship* (DOE Office of Environmental Management, Washington, DC 1999) p 12.

*Ibid* p 36.

### ABOUT THE AUTHOR

Robert Nelson is a Senior Fellow in Environmental Studies at the Competitive Enterprise Institute, focusing on land use and natural resource policy issues. Dr. Nelson is also a professor at the University of Maryland's School of Public Affairs. He has over 18 years of experience with the US Department of Interior conducting economic and policy studies of department programs. He worked especially closely with the Bureau of Land Management's grazing, timber, and coal leasing programs. Additionally, he has served as the staff economist for the US Senate Committee on Indian Affairs. He received the 1989 Meritorious Service Award from the Interior Department, which is the second highest award given by the Department.

Dr. Nelson has written numerous books and articles on economic and public lands issues, including *A Burning Issue*, *A Case for Abolishing the US Forest Service*, *Public Lands and Private Rights*, *The Failure of Scientific Management*, *Reaching for Heaven on Earth*, *The Theological Meaning of Economics*, and *Zoning and Property Rights*. His articles have appeared in publications such as *Forbes*, *The Wall Street Journal*, *The Washington Post*, *The Weekly Standard*, *Technology Review*, and *Regulation*, among others.

Dr. Nelson has a degree in mathematics from Brandeis University and a PhD in economics from Princeton University.